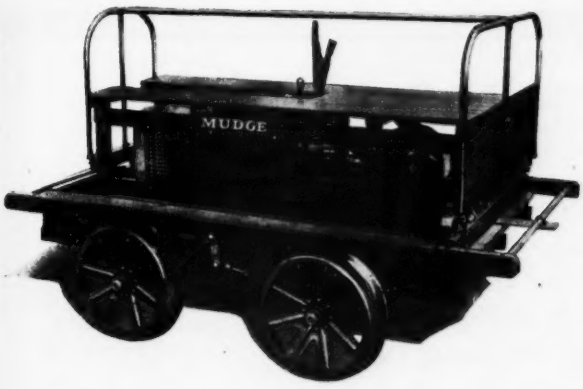
Railway Engineering and Maintenance

RAILWAY ENGINEERING AND MAINTENANCE
Published monthly by Simmons-Boardman Co., at 608 S. Dearborn St., Chicago. Subeription price: United States, Canada and Mexico, $2.00; foreign countries, $3.00 a year. Single copy, 35 cents. Entered at Chicago, Ill., as second-class matter.

Alphabetical Index to Advertisers, Page 64 Classified Index to Advertisers, 60-62



Mudge Class "WS-3"
Heavy Duty Motor Car

Extra

Gangs —require motor cars capable of hauling many men and much material. Some large section gangs with unusual conditions may also require a car of super-characteristics. For this

Service —the Mudge Class WS-3 heavy duty motor car is specifically designed and built. It embodies the three essential characteristics of such a car.

Strength, —built into the frame to withstand heavy loading, twists, and shocks;

Power, —sufficient to conquer grades, winds, etc. The two-speed transmission makes it easy to start with and haul heavy loads;

Simplicity, —insuring dependability and low upkeep cost.

Full details on request.

Condensed Specifications

Motor; 8 hp., single cylinder, 2 port, 2 cycle, water cooled. Lubrication; oil mixed with fuel. Carburetion; special Mudge carburetor. Ignition; battery standard, magneto optional. Cooling; large thermo-syphonic aluminum hopper gives three times ordinary cruising radius. Transmission; combination belt and chain drive. Frame; selected maple and oak. Seating capacity, 10 men; ample space for tools. Wheels, 20 in. Axles, $1\frac{7}{16}$ in. Bearings, Mudge-Bower Roller. Brakes; 4-wheel with adjustable connecting links. Wheel base 37 in. Weight 1150 lbs.

Mudge & Company

Manufacturers—Railroad Equipment
Railway Exchange Bldg. • CHICAGO

CONTENTS

Volume 23 August, 1927 Number 8

294

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

ELMER T. HOWSON, *Editor*
WALTER S. LACHER, *Managing Editor*
N. D. HOWARD, *Associate Editor*
F. C. KOCH, *Business Manager*
H. F. LANE, *Associate Editor*, (Washington, D. C.)
F. M. PATTERSON, *Associate Editor*

Published on the last Thursday preceding the date of issue by the

Simmons-Boardman Publishing Company, 608 South Dearborn Street, Chicago, Ill.

EDWARD A. SIMMONS, *President*
L. B. SHERMAN, *Vice-Pres.*
HENRY LEE, *Vice-Pres. & Treas.*
SAMUEL O. DUNN, *Vice-Pres.*
F. H. THOMPSON, *Vice-Pres.*
C. R. MILLS, *Vice-Pres*
ROY V. WRIGHT, *Sec'y*

NEW YORK: 30 Church Street
MANDEVILLE, LA.
CLEVELAND: 6007 Euclid Avenue
WASHINGTON: 17 and H Streets, N. W.
SAN FRANCISCO: 74 New Montgomery Street
LONDON, England: 34, Victoria St., Westminster, S. W. 1
Cable Address: Urasigmec, London

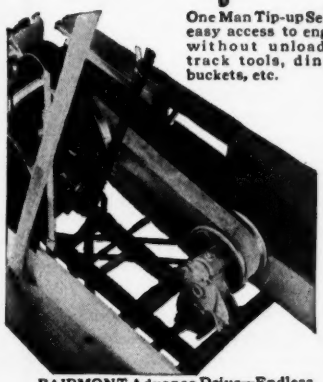
Entered at the postoffice at Chicago, Ill., as mail matter of the second class.

Request for change of address should reach us two weeks before the date of the issue with which it is to go into effect. It is difficult and often impossible to supply back numbers to replace those undelivered through failure to send advance notice. In sending us change of address please be sure to send us your old address as well as the new one.

Subscription price in the United States, Canada and Mexico, $2.00 per year; foreign countries $3.00. Single copies, 35 cents. Foreign subscriptions may be paid through our London office (34, Victoria Street, S. W. 1) in £-s-d.

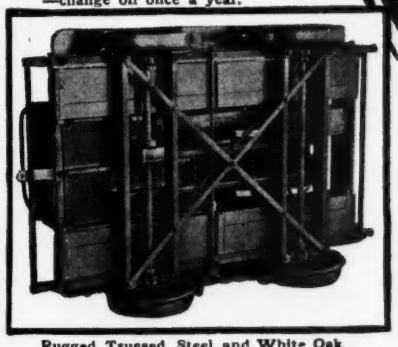
Railway Engineering and Maintenance is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulation (A. B. C.)

One Man Tip-up Seat—easy access to engine without unloading track tools, dinner buckets, etc.



FAIRMONT Advance Drive—Endless Cord Belt—light tension—reduction by ball and roller bearing hardened steel gears in oil-tight dirt-proof case—change oil once a year.

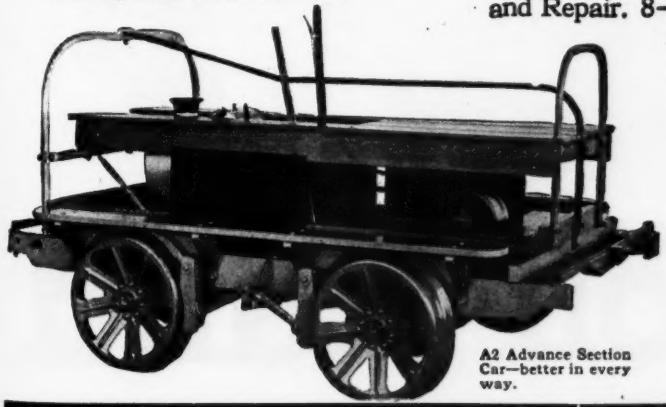
Why HALF the Railway Motor Cars are Fairmont



Rugged Trussed Steel and White Oak Frame—no rivets—all parts replaceable.

In the words of an executive with 25 years' mechanical experience, ten of these years in charge of purchase and maintenance of all gas engines and cars on a Class A railroad—Fairmont Motor Cars are so popular with railroad men because of:

"1—Favorable Initial Cost. 2—Long Life. 3—Low Maintenance. 4—Easy Starting and Operation. 5—Simple. 6—Minimum Moving Parts. 7—Ease of Adjustment and Repair. 8—Water Cooling insures long continuous runs or stationary service. 9—Endless Cord Belt Transmission—low initial cost—freedom from failures—smooth and easy to handle. 10—Low Repair Stock Investment."



A2 Advance Section Car—better in every way.

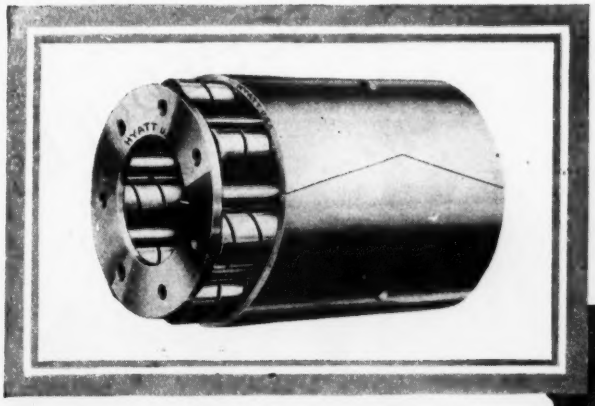
FAIRMONT RAILWAY MOTORS, Inc.
FAIRMONT, MINNESOTA

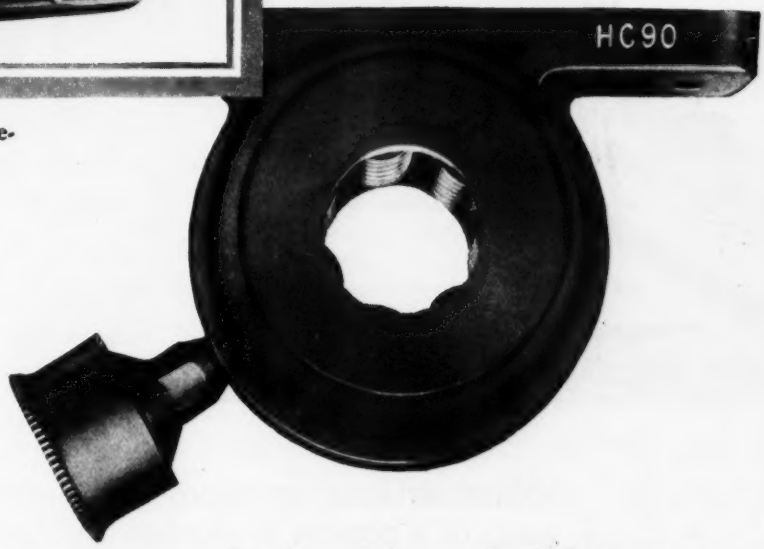
DISTRICT SALES OFFICES:

New York Chicago St. Louis New Orleans
San Francisco Washington, D. C.
Winnipeg, Can.

BALDWIN LOCOMOTIVE WORKS
Foreign Representatives

Hyattize your section cars for heavy duty





Hyattized cars or Hyattized replacement boxes are furnished by these leading manufacturers:

Buda
Sylvester
Northwestern
Fairbanks-Morse
Mudge
Fairmont
Kalamazoo

HYATTIZED cars can carry heavier loads, constantly and more efficiently. No coaxing. No track-side tinkering. They take your men to the job, and bring them back, quickly and dependably.

Year after year, under the most exacting conditions, Hyatts are giving continuous, economical service. Their helical rollers absorb the shocks of load and keep the lubricant circulating. New grease is required only three or four times a year. No other attention is necessary.

Don't wait until you need new cars to take advantage of Hyatt service. Leading maintenance car builders furnish replacement boxes to fit your present equipment. Write our nearest office for details.

HYATT ROLLER BEARING CO.

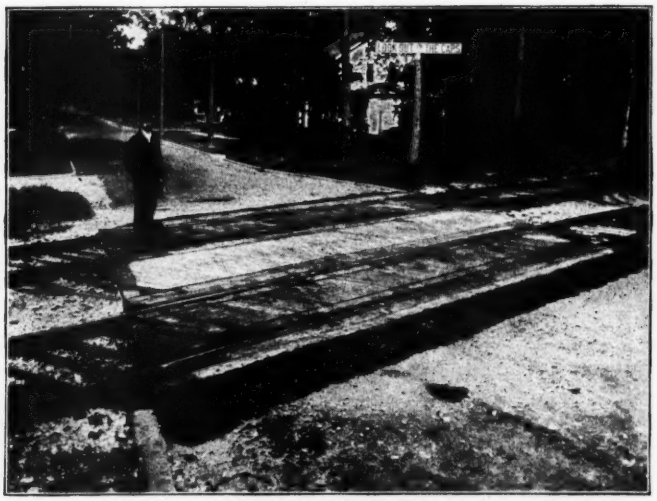
Newark Detroit Chicago Pittsburgh
Worcester Oakland Philadelphia Cleveland

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

This modern crossing is by Carey Elastite Pre-



Minneapolis, St. Paul & Sault Ste. Marie R. R. Crossing, River Forest, Illinois, protected for years to come against weather and traffic by Carey Elastite Preformed Track Pavement.

ITS maintenance cost will be little or nothing. It will not require constant watching. And so readily does this smooth, watertight crossing adjust itself to traffic over the rails and highway, there'll be no patching, no need for expensive replacements.

For through the use of Carey Elastite Preformed Track Pavement, the tracks and pavement move together under traffic im-

protected indefinitely formed Track Pavement

pact, as a single, resilient, concussion-proof unit.

Of course, you'll want to know more about this crossing—about the improved crossing pavement that protects it. A letter will bring you full information—write it today.

Carey Elastite Preformed Track Pavement consists of slabs about two inches thick and sections of rail filler, both made of a fibrous, asphaltic material that knits and heals under traffic. The preformed slabs are cut to fit. Set snugly in place with ordinary tools and ordinary labor, they form a water-tight, traffic-proof crossing that will last indefinitely.

THE PHILIP CAREY CO.

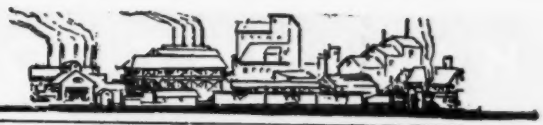
Lockland, Cincinnati, Ohio

Carey Elastite

PREFORMED
TRACK PAVEMENT

"Knits and heals under traffic"

OF LEADERSHIP



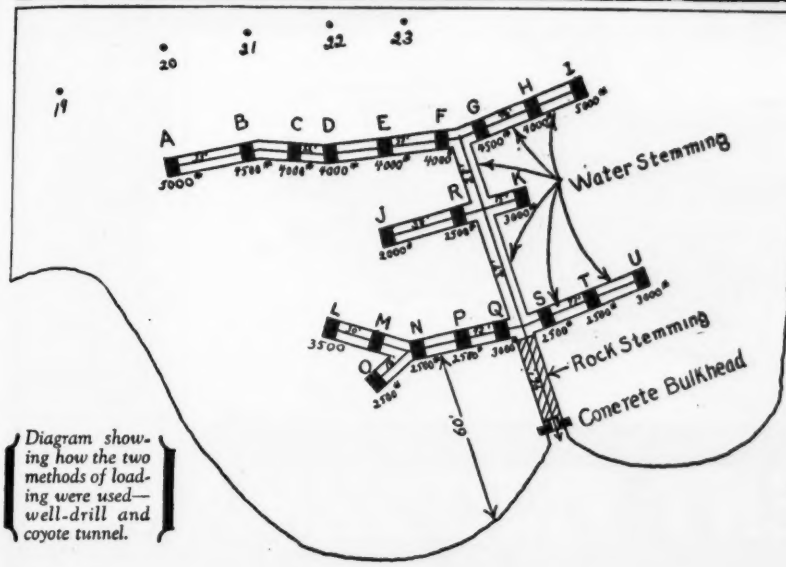


Diagram showing how the two methods of loading were used—well-drill and coyote tunnel.

The Largest Quarry Shot

in hard rock ever fired in the United States

MORE than three thousand people gathered on the hillside facing the great cliff . . . leading quarry men, explosives experts, engineers and visitors came from surrounding cities and towns . . . the cliff stared back, solid, defiant . . . 280 feet high and 800 feet long . . . and then at exactly 2 P. M. (standard time) on Monday, May 30th . . . a long blast of the siren . . . five hushed minutes . . . a shot . . . five long seconds while the crowd literally held its breath . . . suddenly . . . the ground shook . . . a dull roar filled the air . . . and a million tons of rock slowly heaved forward and crashed to the vast quarry floor with a thunderous earth shaking.

Three factors of this gigantic shot at the Birdsboro, Pa., quarry of the John T. Dyer Quarry Company excited this tremendous interest. 170,000 pounds of du Pont 60% and 75% Quarry Gelatin were fired in this one shot—the largest amount of explosives used in a single shot in hard rock in the United States. Second, this is the first time in this country that two types of loading — well-drill and coyote hole — were fired simultaneously in the same face. And the third unusual feature is the fact of tunnel blasting in a face as high as 280 feet.

This coyote tunnel drove 100 feet into the cliff with six wings — a total of 430 feet. It was tamped with about 80,000 gallons of water and a bulkhead made of 40 feet of stone and clay.

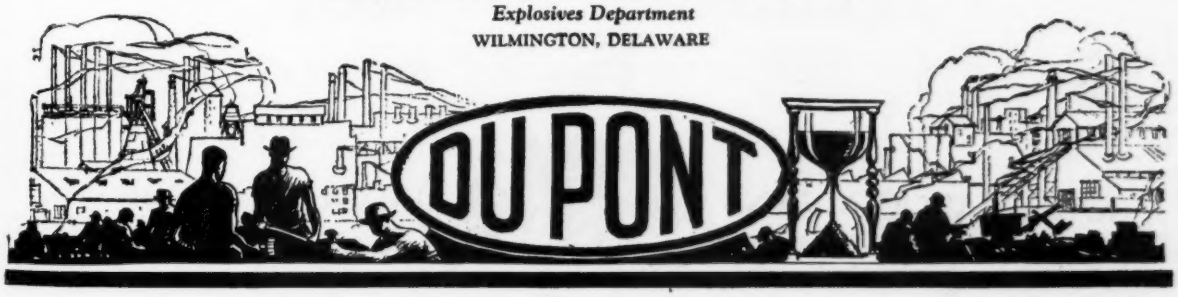
In addition to the tunnel, 23 well-drill holes were driven down 200 feet and more with a 50-foot toe, tamped with a carload of stone dust.

Du Pont is more than an explosives manufacturer: du Pont *renders* far more service than it ever *talks* about. A job like this for the John T. Dyer Quarry Company is fairly characteristic of what you may expect of du Pont explosives and explosives service.

E. I. DU PONT DE NEMOURS & CO., INC.

Explosives Department

WILMINGTON, DELAWARE



"--their use saved important sums"

one of the scenic wonders of America, is reached by a short side trip. A large portion of the new route is through a primeval wilderness of Douglas fir, white pine, sugar pine,

It has 80 fewer curves than the previous track between these points and 713 ft. less ascending to do in other direction.

Bridges and Culverts.— A large number of corrugated pipes were used for the waterways of less than 16 sq. ft. cross-sectional area; and this form of culvert proved surprisingly effective in reducing construction costs. It was desirable to get culvert structures installed ahead of the grading operations, as this greatly facilitated all subsequent work. Adoption of such a plan, however, involved hauling culvert materials for long distances on trucks and wagons over the worst of mountain terrain where roads are practically non-existent. The corrugated pipes, because of their lightness and toughness, were peculiarly adapted to such situations; and it was found that their use was the means of saving important sums. In addition to a great many Armco pipes in the smaller sizes, quite a number of 48 in. and a few of 60 in. diameter in number 8 gauge iron were employed; and most of these are functioning perfectly even where placed under fills from twenty to thirty feet in height.

The new line will be of the greatest benefit, not only to the region it directly traverses,

This paragraph from an article in the January, Engineering and Contracting tells a story of great importance to the engineer who would keep grading and construction costs at a minimum—just one of the many advantages that made Armco the predominant culvert.

"Look under your roads" The only dependable evidence of culvert durability is that supplied by culverts now in service under the roads in your own territory. Get this evidence through your own independent investigation or ask other engineers who have conducted such investigations what they have found out.

Armco Culvert Manufacturers Association
Middletown, Ohio

ARMCO CULVERTS

Predominant in use—because predominant in quality

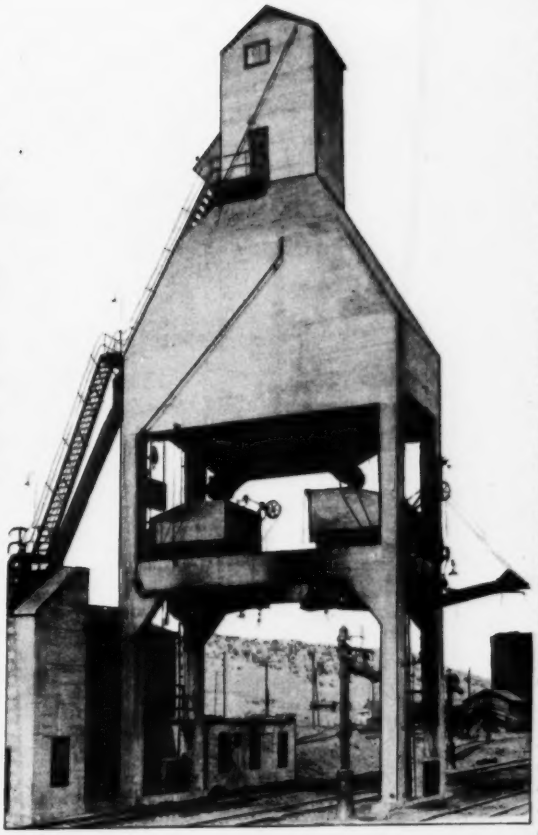
Make the layout justify the outlay

More than 700 highly successful coaling stations tell their own story of the value of centering the responsibility for coaling station layout and construction in Fairbanks-Morse engineers.

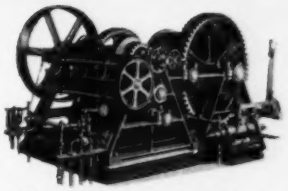
Practically every type of equipment needed in building any type of coaling station is included in the comprehensive F-M line of conveyors, hoisting units, fixtures, scales, engines, pumps and electric motors.

And thus the completed station represents not only the result of unsurpassed experience in coaling station design but also a unit in which every component is built and backed by an old-established organization that has built its reputation on guaranties fulfilled.

One of our engineers would like to explain Fairbanks-Morse service in greater detail.



300-ton reinforcea concrete coal and sand station on the A.T. & S.F. Ry. Co. at Lamy, N. M., built over main line tracks. Equipment includes two 15-ton scale pockets with Fairbanks scales; one No. 2 automatic hoist with hydraulic control: one 15-hp. Type Y oil engine.



The unit that made the skip-hoist station an outstanding success. It automatically controls and protects the entire cycle of hoisting, timing, reversing. Ask for details.

FAIRBANKS, MORSE & CO., *Chicago*

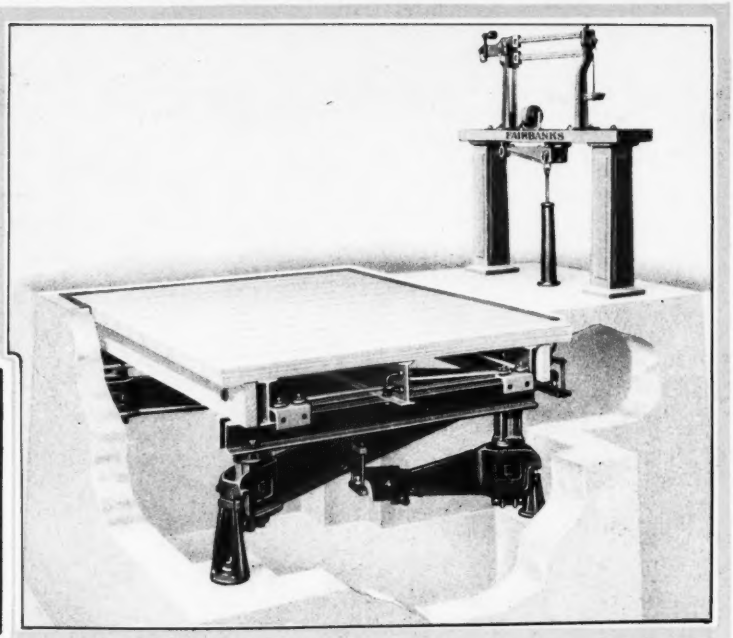
And 40 other principal cities—A service station at each house

Coaling Stations

built throughout by

FAIRBANKS-MORSE

Full-capacity dial for use with warehouse or freight house scale illustrated opposite



Fairbanks Suspension-Platform Built-in Scale

Now a warehouse scale
built expressly for concentrated loads

With the increased use of the tractor for handling heavy loads has come a new need for freight house scales built to withstand capacity loads concentrated on a portion of the scale platform.

A Fairbanks Built-in Warehouse Scale has been developed that will definitely meet this new condition. It is built on the foundation of unequaled experience in scale building and represents the result of an exhaustive study of actual conditions in the field.

Meets specifications of A. R. E. A. Scale Committee

In every detail—platform dimensions, weighing capacities, styles of beam, allowable stresses and plans of installation—this scale is strictly in accord with the report of the American Railway Engineering Association Scale Committee.

The suspended-platform principle is used, the load being transmitted to the lever system through a flexible combination of elements that allows the platform to be disturbed when loading the scale but does not affect the contact between knife edges and bearings. This assures sustained accuracy and maximum sensitiveness.

The most liberal safety factor is employed throughout, and the scale is built either for installation on stands or for suspension from floor beams. Capacities range from 10,000 to 20,000 pounds. Warehouse scales of this type are equipped with either double beam, full-capacity beam, type-registering beam or full-capacity dial as illustrated above.

Ask for special bulletin describing this finer warehouse scale in detail.

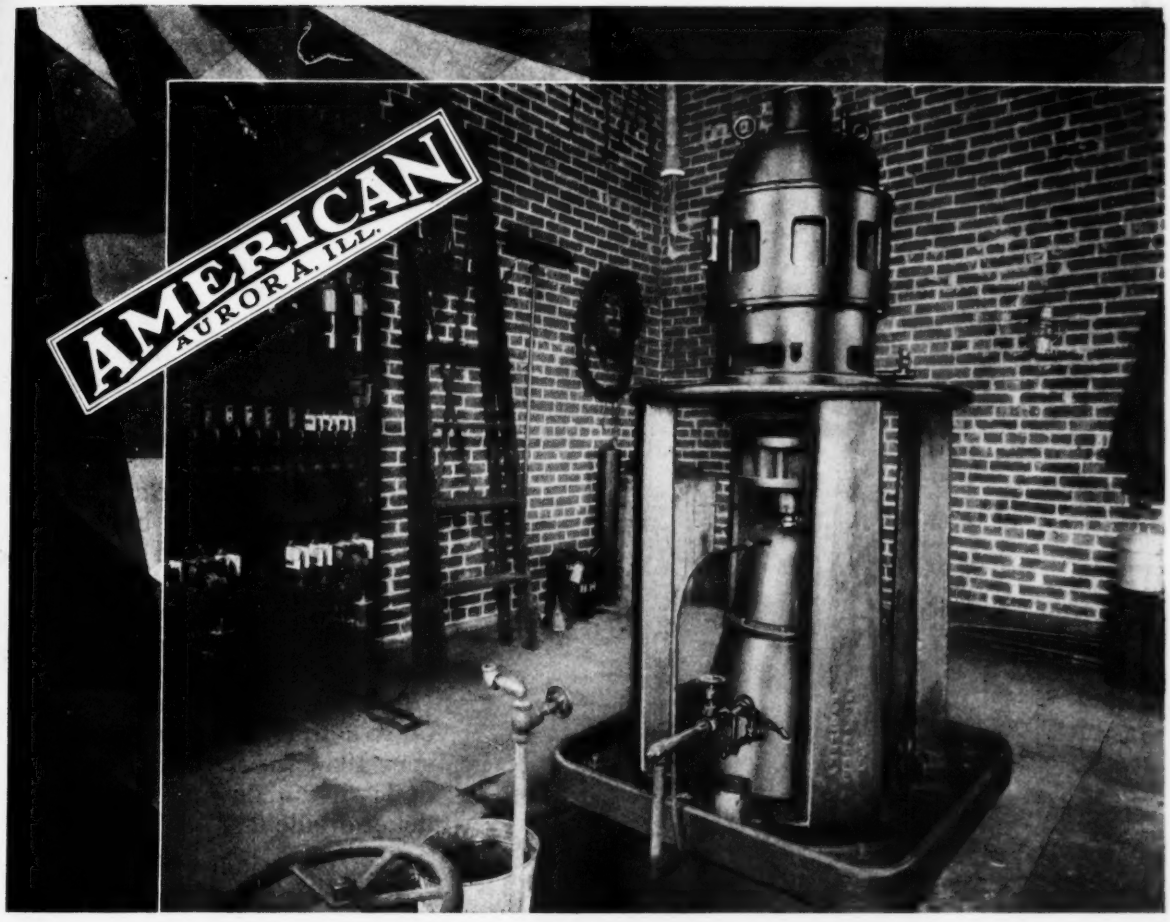
Fairbanks Scales

FAIRBANKS, MORSE & CO., *Chicago*

And 40 principal cities—A service station at each house

Preferred the World Over

ARSA21.1



An "American" Turbine on the C. & E. I.

District Sales Agencies:

Dallas, Tex.	Birmingham, Ala.
Boston, Mass.	Joplin, Mo.
Detroit, Mich.	Atlanta, Ga.
Tulsa, Okla.	Jacksonville, Fla.
Denver, Colo.	Charlotte, N. C.
St. Louis, Mo.	Pittsburgh, Pa.
Salt Lake City, Utah	Roswell, N. M.
Vancouver, B. C., Can.	Philadelphia, Pa.
Omaha, Neb.	Kansas City, Mo.
St. Paul, Minn.	

Branch Offices:

Chicago, Ill.
1615 First Nat. Bank Bldg.
New York, N. Y.
Room 523—
165 Broadway
San Francisco, Calif.
635 Mission St.
Los Angeles, Calif.
420 E. Third St.

AN "AMERICAN" 15-inch, three stage, deep-well turbine was installed for the C. & E. I. Railroad Company at Clinton, Ind.

This "American" turbine in the Jackson Yard is designed to have a capacity of 500 G. P. M. against a total head of 110 feet when running at 1165 R. P. M.

The pump is operated by a vertical motor and the equipment is used for serving the water tanks in the Yard.

The "American" trade mark, with its guarantee of satisfactory performance, may be found on the pump equipment of many of the leading railroads of the country.

THE AMERICAN WELL WORKS

General Offices AURORA, ILLINOIS *and Factory*

SAVE 60% OF LABOR AND TOOL COSTS

WHAT ALL MAINTE-NANCE OFFICIALS WANT

TRY THEM ON TOUGH JOBS— THEY ALWAYS MAKE GOOD

Showing 3 Men Lining Track with 3 Hackmann Combination Track Liners
Saving Labor Cost of 4 or 5 Men
7 Men Can Do the Work of 15 or 20 Men

EFFICIENCY WITH ECONOMY

Now in use on over 100 railroads.

Results always far above expectations.

Labor costs cut in half.

Small and easy to handle. Weight only 20 lbs. Made of steel.

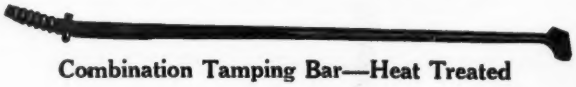
Lines track, frogs and switches.

Raises low joints and spaces ties.

Smooths rough track without disturbing road bed. Can be operated against the end of switch ties.

HACKMANN TRACK LINERS HAVE ALL THE ABOVE STERLING QUALITIES

Combination Lining Bar—Heat Treated



Combination Tamping Bar—Heat Treated

Hackmann Combination Track Liner

Hackmann Combination Track Liners are operated with the above special bar.

Hackmann Duplex Track Liners are operated with ordinary lining bar. Removable Fulcrum.

Note the Two Step Feature at top of base. You can make at least two pulls without resetting the liner. They can be left in track, allowing trains to pass over without any danger.

Hackmann Duplex Track Liner

WRITE FOR ILLUSTRATED AND DESCRIPTIVE LITERATURE

THE HACKMANN RAILWAY SUPPLY CO.

J. J. FRANZEN, *Secretary and Treasurer*

RAILWAY LABOR SAVING DEVICES—723 S. WELLS ST., CHICAGO

THOMAS D. CROWLEY CO.
Representatives
Chicago, Ill.

BALDWIN LOCOMOTIVE WORKS
Foreign Representatives
Philadelphia, Pa.

WM. ZEIGLER & CO.
425 S. Fifth Street
Minneapolis, Minn.

THE HOLDEN CO., Ltd., Canada
Montreal Toronto Winnipeg
Vancouver

ADDRESS ALL COMMUNICATIONS TO THE COMPANY

PHOTOGRAPH showing part of a cast iron pipe installation at Chicago, Illinois.

Standard Bell and Spigot can be laid easily

even under the most unusual conditions

THE cast iron pipe illustrated here passes through an *unlined* rock tunnel.

The strength of Cast Iron Pipe makes this type of installation possible. The accessibility of lines laid in this manner will be quickly appreciated by engineers.

Contractors have long been aware of the ease of standard Cast Iron Pipe installations and can make their bids accordingly.

We maintain a special Service Department for the assistance of contractors and construction engineers. Information about it will be sent to you gladly—write for details, there is no obligation involved.

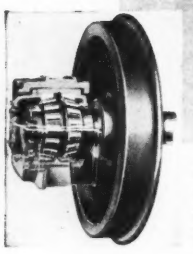
United States Cast Iron Pipe and Foundry Company

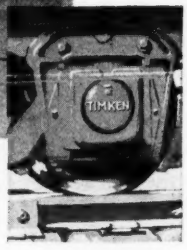
General Offices:

Burlington, New Jersey

SALES OFFICES

Philadelphia: 1421 Chestnut St.
Chicago: 122 So. Michigan Blvd.
Birmingham: 1st Ave. & 20th St.
Buffalo: 957 East Ferry Street
Cleveland: 1150 East 26th Street
New York: 71 Broadway
San Francisco: 3rd & Market Sts.
Pittsburgh: 6th & Smithfield Sts.
Dallas: Akard & Commerce Sts.
Kansas City: 13th & Locust Sts.
Minneapolis: 6th St. & Hennepin Ave.





International Newsreel

Viewing a Timken railroad bearing application on display in the baggage car of the "Pioneer Limited." From left to right: President H. E. Byram of the Milwaukee Road; Mr. H. H. Timken, President of The Timken Roller Bearing Company; Mr. J. T. Gillick, Chief Operating Officer of the railroad; General Passenger Agent W. B. Dixon; and the Engineer of the train, Mr. Nicholas Kaiser.

Railroad History in the Making

A new epoch in railroad history dates from May 21, 1927. On that day the "Pioneer Limited" of the C. M. & St. Paul R. R. entered regular service with every car on Timken Tapered Roller Bearings. A few weeks later the "Olympian," also completely equipped with Timken Bearings, started schedule operation between Chicago and Seattle.

Never before, anywhere in the world, have any anti-friction bearings been used throughout any Pullman train. These famous flyers of the Milwaukee Road are destined to make momentous and enduring railroad history.

The 88% reduction in starting load due to friction elimination only begins to express the value of Timken-equipped car journals. Eliminating wear, hot boxes, and by far the greater part of lubrication costs, Timken Tapered Roller Bearings with their tapered design, Timken-made Electric Steel and *POSITIVELY ALIGNED ROLLS* have brought a new day in the whole field of railroad economics.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

$40,000,000 SAVING IN MAINTENANCE

Minimizes Mechanical Wear

EIGHT million dollars expended annually for cross ties is typical for Class I Railroads.

Extending tie life five years by eliminating mechanical abrasion through the use of Lundie Tie Plates makes possible a saving of $40,000,000 over a twenty year period.

Cross ties are the largest item of maintenance of way expense. More ties are destroyed by mechanical wear than by decay—so the Lundie Tie Plate offers the greatest opportunity for maximum reduction of maintenance of way costs.

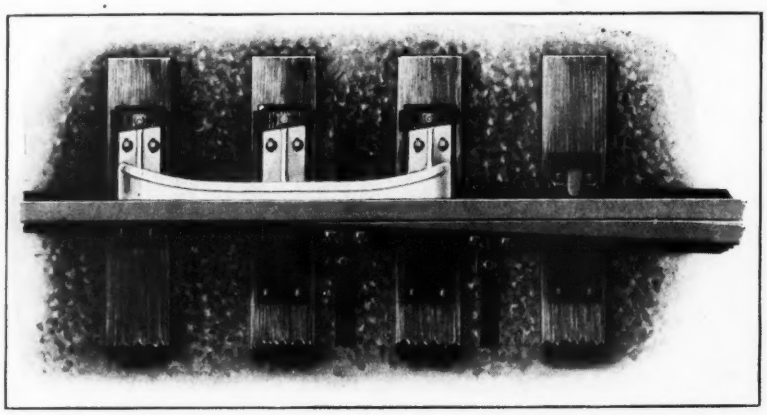
LUNDIE Tie Plates are as essential as creosoted ties—money spent on costly treated ties is lost when the cutting ribs of practically all tie plates break down the wood fibers, allowing moisture to penetrate below the safety line.

Lundie Tie Plates are more than mere tie plates—they are positive insurance against mechanical wear. Through scientific design they hold gauge under the most severe conditions without cutting a single fiber of the tie. It is economy to buy the best cross ties obtainable if you protect that investment with Lundie Tie Plates.

There is no substitute.

The Lundie Engineering Corporation
285 Madison Avenue, New York
166 West Jackson Boulevard, Chicago

LUNDIE TIE PLATE



WHEELS DON'T CROWD

—where this switch point protection is installed.

The flange of the RACOR Manganese Flange Switch Guard is secured outside the running rail at the point of switch and, with maximum clearance from the gage line at its closest point, it does away, once and for all, with the possibility of "wheel crowding." Wheels touching the flange run with equal clearance from either rail and are **not** deflected against the protected and unprotected points—items of the utmost importance in switch point protection.

RACOR Manganese Flange Switch Guards can be used with any standard switch. They are of substantial design and rigid construction, with an unexcelled record of durability and dependable performance. In common with all RACOR products they are **"BUILT FOR HEAVY SERVICE"**

Sales Offices at
30 CHURCH ST., New York

MAIN OFFICE—HILLBURN, NEW YORK

Niagara Falls, New York	East St. Louis, Ill.	Superior, Wisconsin
Niagara Falls, Canada	Pueblo, Colorado	Los Angeles, Calif.

RAMAPO AJAX CORPORATION

Speed! Efficiency! Economy!

No motor, no gears, no eccentrics. Just one moving part!

In addition to running 4 tie tampers, the power plant is adapted to run all kinds of electric tools, flood lights, etc. Takes power to any job!

The Syntron Electric Tie Tamper combines the power of air with the convenience and economy of electricity. The tamper has only one moving part—the piston—which is drawn back and forth in an enclosed barrel 1500 times a minute, striking the tamping tool at one end and a recoil spring at the other. No compressor! No valves or air lines!

The Syntron Tie Tamper is powered by a gas-electric power plant so small and compact that it can be moved quickly enough to permit its use in heavy main line traffic.

Syntron's rapid, powerful blows force the ballast squarely under the tie until every crevice is packed tight. It takes the place of a gang of twelve and makes a smoother, longer-lasting road bed. Power and upkeep costs are negligible.

To those who are interested in improving the work and at the same time reducing the cost of road maintenance, the Syntron Electric Tie Tamper offers... SPEED!... EFFICIENCY!... ECONOMY!

SYNTRON COMPANY

400 Lexington Ave. Dept. H-1 Pittsburgh, Penna.

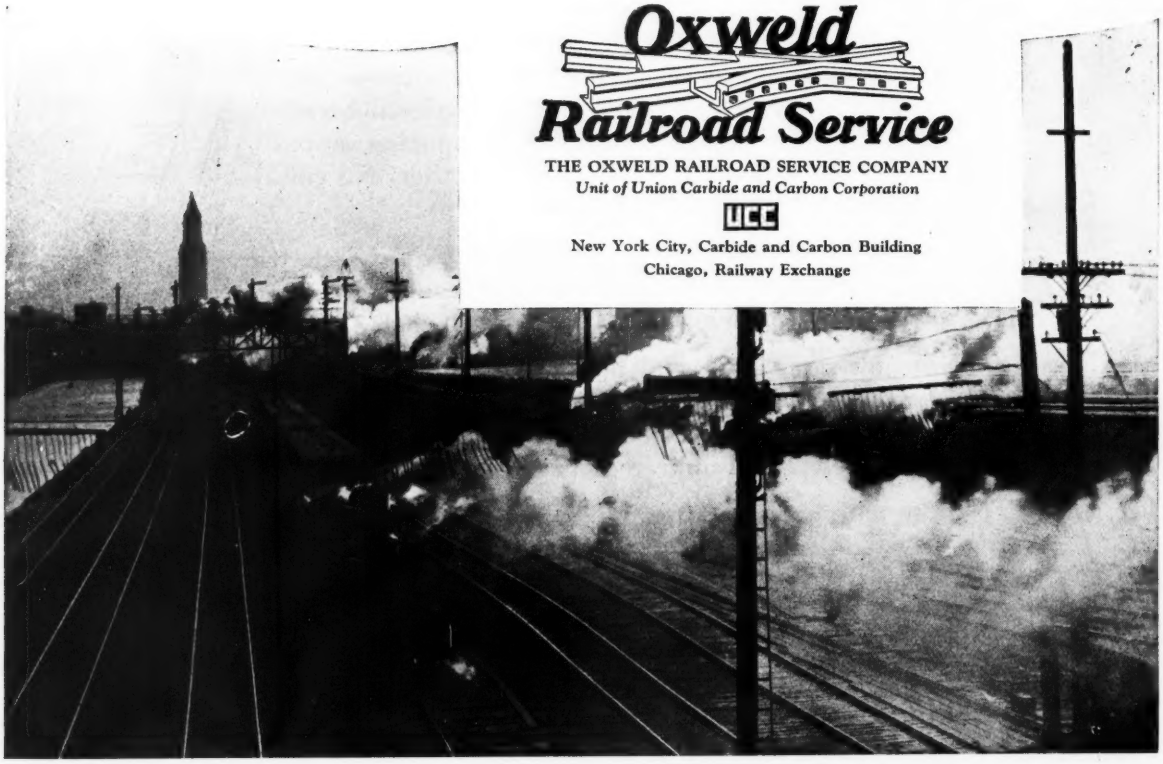
Railroads of tomorrow

ON the railroad tracks of America today there are 70,000 locomotives to pull 2,500,000 freight cars and 70,000 passenger cars. The organizations necessary to operate these large railroad systems are marvels of efficiency.

Yet today railroads are being merged into even greater systems and railroad men generally endorse these larger systems of the future as sound and economical.

In its own field of oxwelding service for railroads, Oxweld Railroad Service functions on the same general principles. That's why railroads controlling a majority of the trackage of the country are operating under Oxweld Railroad Service contracts.

Customers benefit from this contact with oxwelding developments throughout the entire country. These developments are applied to the special requirements of each railroad by service men who are practically a part of the railroad organization.



A one man job with a Hayward

Coaling locomotives is a one man job with a Hayward Bucket. An engine gets its fuel supply in short order, and the bucket is ready for the next job.

Hayward speed is assured on three counts—rapid digging, rapid discharging, and the big bites which mean fewer trips. Hayward strength speaks for itself; watch a Hayward in action.

Through long experience in diversified railroad work, Hayward engineers are qualified to recommend a bucket to fit the job. Consult them without obligation.

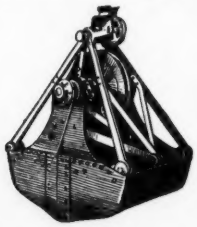
THE HAYWARD COMPANY
46 Dey Street New York, N. Y.

Builders of Clam Shell, Drag Line, Orange Peel and Electric Motor Buckets; Dredging, Excavating, and Coal Handling Machinery, Automatic Take-Up Reels; Counterweight Drums.

HAYCO

Hayward Buckets

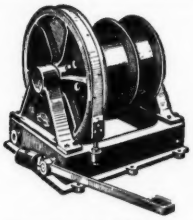
Electric Motor Buckets



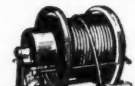
Clam Shell Buckets

Orange Peel Buckets

Drag Scraper Buckets

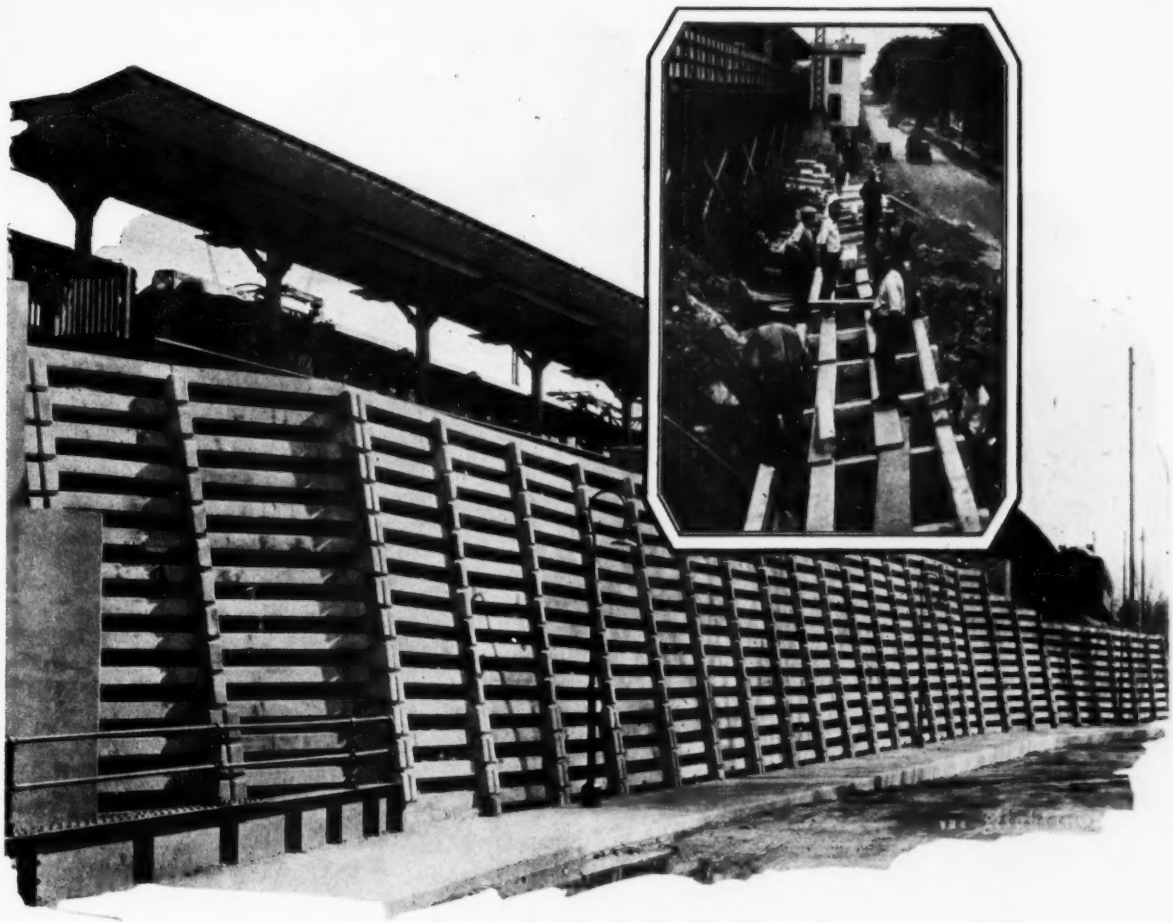


Counterweight Drums



Automatic Take-Up Reels

Skid Excavators and Dredges



Where space is limited—
use a Massey Crib Wall

IN many grade separation programs, a wall must be built without interference to traffic on one side and without encroaching on private property on the other side.

The erection of forms and the operation of a mixing plant for a monolithic wall is almost impossible under such conditions. But a Massey Cribbing Wall can be laid within the space it is to occupy. No interference to traffic is necessary. No permission to use adjacent property is required. Just lay up the cribbing and backfill.

Massey Cribbing is not only practicable where space is limited, but it is much more economical than monolithic construction. Catalog supplement No. 20 contains interesting information on retaining wall construction. Ask for a copy.

MASSEY

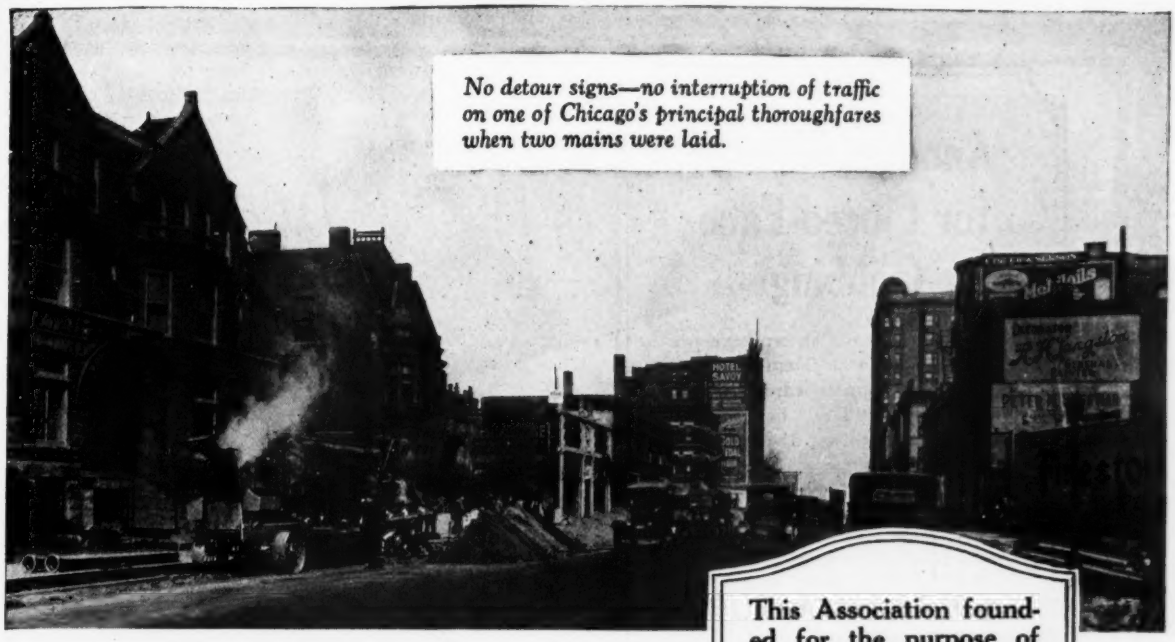
Concrete Products Corporation
Peoples Gas Building, Chicago

Sales Offices: **New York, Atlanta, Cincinnati, St. Louis, Los Angeles**

Canadian Concrete Products Co., Limited,
Transportation Building, Montreal, Que.

Massey Cribbing is produced in the same plants and is of the same high quality as Massey Culvert Pipe and other precast concrete products which have been standard construction on the leading railroads for years.

RE&M-8-Gray



No detour signs—no interruption of traffic on one of Chicago's principal thoroughfares when two mains were laid.

Chicago was quick to see advantages of two water mains

All engineers and officials interested in city growth of tomorrow are planning for improvements underneath as well as above the level of the street.

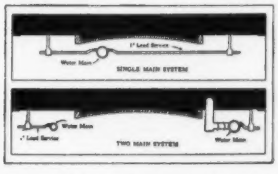
THIS has been proved to be sound practice, both from an engineering and an economic standpoint. Nothing irritates the citizens of a community, more than torn-up streets. Instinctively they blame the city officials.

The "two mains" system obviates for all time the necessity of tearing up the paving so far as the gas and water systems are concerned.

Service pipes can be installed while building construction is in progress.

There are no dead services. Mains are removed from the proximity of street car tracks—they are beyond the curbs, away from center of the street traffic. This is of great importance where engineers have had trouble due to electrolytic action.

The benefits of the "two mains" system in busy cities are so great that every municipal official should acquaint himself with the facts.



A reprint of an article that appeared in the American City on the subject of the two mains system will be forwarded to any who may not have seen it. Address:

THE CAST IRON PIPE RESEARCH ASSOCIATION
People's Gas Building, Chicago, Ill.

This Association founded for the purpose of giving information and help—*it has nothing to sell.*

Its primary interest is the collection and distribution of all information relative to Cast Iron Pipe for all purposes—and in arousing public interest in waterworks construction.

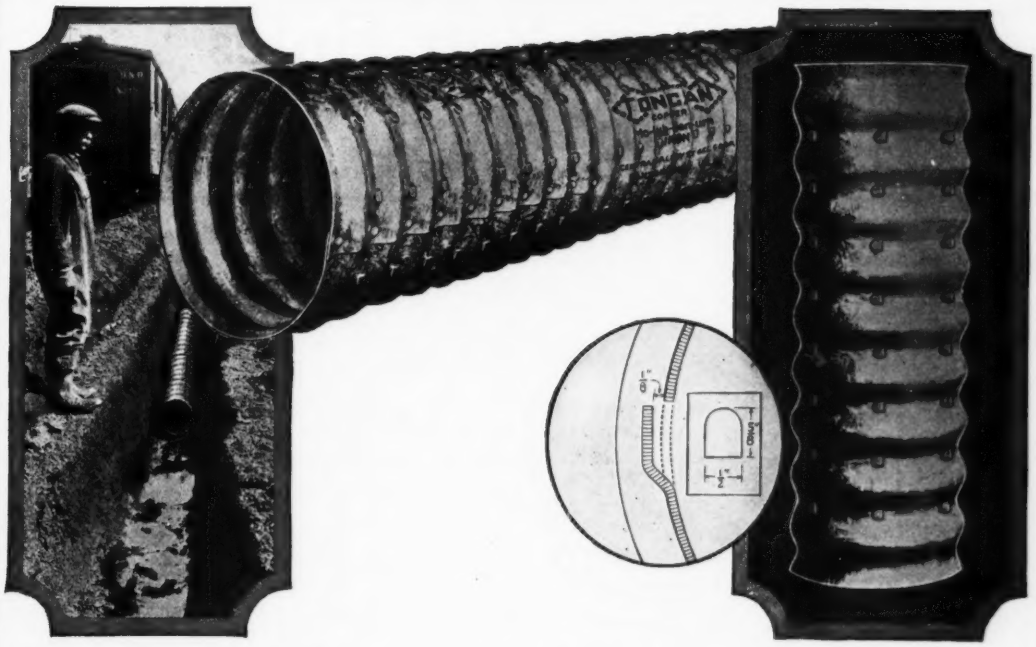
Consulting Engineers, Contractors and Municipal Officials are invited to write.

Of especial importance is an article on the "two mains system." Write to the Research Engineer for a copy of this or other literature on the subject of water systems, which may be interesting to you.

BELL and SPIGOT JOINT—*the accepted standard for underground construction.*

CAST IRON PIPE

—In continuous service for over 250 years



Toncan Pioneers Again With This Improved Drain

TONCAN COPPER Mo-lyb-den-um IRON

Following are the makers of Toncan Culverts. Write the nearest one:

The Berger Manufacturing Co. Roanoke, Virginia
Tri-State Culvert Mfg. Co. Memphis, Tenn.
The Canton Culvert & Silo Co. Canton, Ohio
The Firman L. Carswell Mfg. Co. Kansas City, Kan.
The Berger Manufacturing Co. Minneapolis, Minn.
The Berger Mfg. Co., of Mass. Boston, Mass.
The Berger Manufacturing Co. Philadelphia, Pa.
The Berger Manufacturing Co. Dallas, Texas
The Berger Manufacturing Co. Jacksonville, Florida
The Pedlar People Limited, Oshawa, Ontario, Canada
Wheat Culvert Co., Inc. Newport, Ky.

SEVENTEEN years ago, the makers of Toncan Iron originated the perforated corrugated iron drain for railroad service.

Appreciating its greater strength, flexibility, freedom from breakage and alignment troubles, and its high corrosion-resistance, the railroads have used miles of this Toncan Iron Drain.

Today, the makers of Toncan Iron offer a vitally improved Drain to the railroads. The ordinary drain holes have been replaced by outward-tongued perforations that provide maximum drainage efficiency and yet retard the seepage of dirt into the pipe.

Even better service from drains is now available through this new development by the makers of Toncan Iron Drains. Ask about it.

CENTRAL ALLOY STEEL CORPORATION, *Massillon*, OHIO

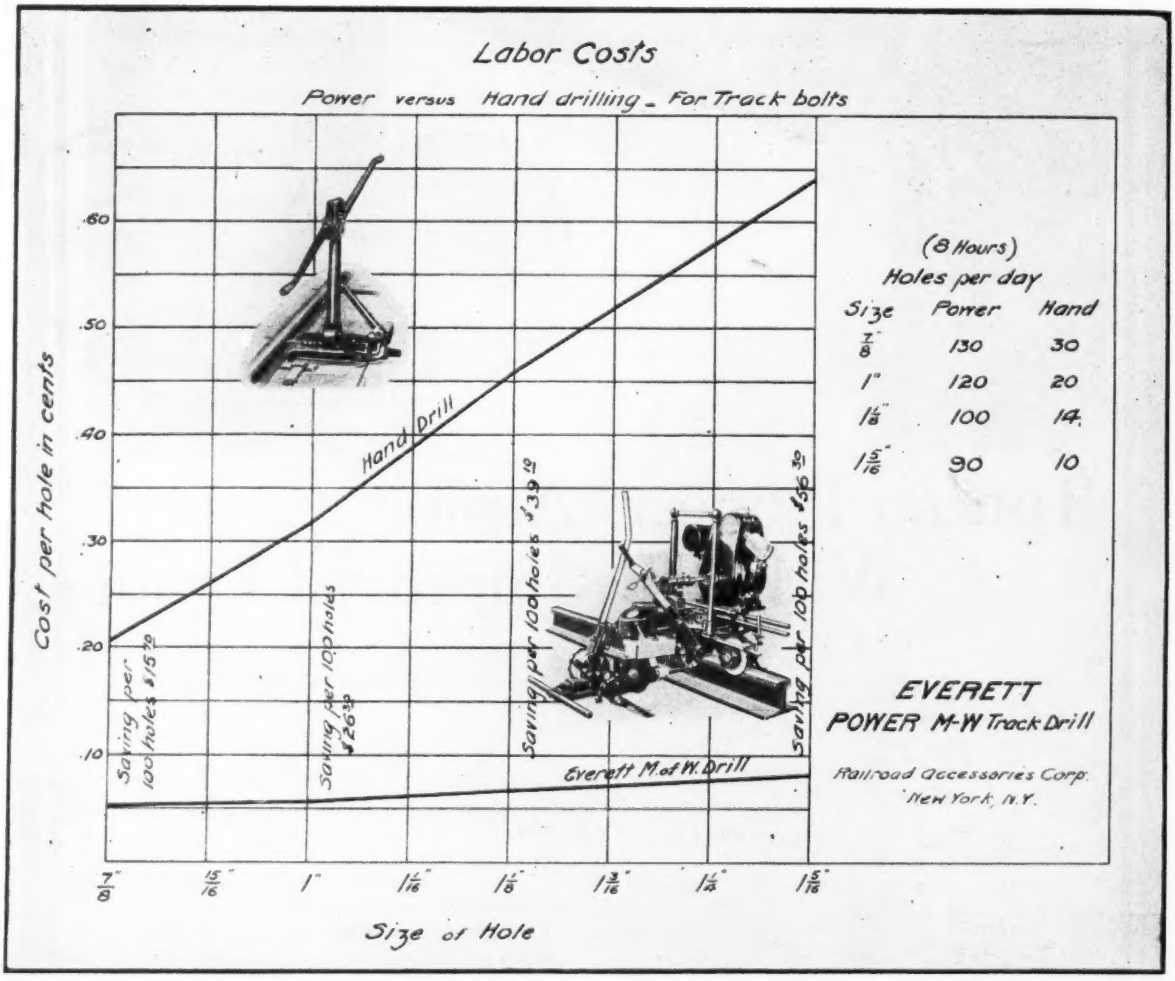
World's Largest and Most Highly Specialized Alloy Steel Producers

Makers of Agathon Alloy Steels

Cleveland Detroit Chicago New York St. Louis
Syracuse Philadelphia Los Angeles Tulsa
Cincinnati San Francisco Seattle

TONCAN COPPER MO-LYB-DEN-UM IRON

Why You Can No Longer Afford To Drill Bolt Holes By Hand



IN ADDITION to the savings effected in drilling, the Everett Power M-W Track Drill can now be equipped with a chuck that will run up nuts to within one-half turn of permanent tightness.

RAILROAD ACCESSORIES CORPORATION

Main Office:
415 Lexington Ave.
New York, N. Y.

Western Office:
Railway Exchange Bldg.
Chicago, Ill.

Factories: { **Long Island City, N. Y.** / **Albany, N. Y.**

Siemen's and General Electric Railway Signal Co., Ltd., 21 Great Queen St., Kingsway, London, Eng., Agents for Great Britain, So. Africa, Australia, New Zealand, India, Argentine Republic, France, Belgium and China

Railway
Engineering and Maintenance

Volume 23 August, 1927 Number 8

CHICAGO OFFICES MOVE

THE Chicago offices of *Railway Engineering and Maintenance*, the Railway Age and other publications of the Simmons-Boardman Publishing Company, will be moved on August 13 from the Transportation building, 608 South Dearborn street, to the Bankers building, 105 West Adams street (corner of Clark). In our larger quarters, we will be able to meet more adequately the growing demands for service to the railway and the railway supply industries. We hope that our friends will call on us even more frequently in our new location than they have in the past.

ANOTHER RECORD BREAKING SEASON

IN THE June issue we referred editorially to the increasingly liberal expenditures which the railways are making for roadway improvements and to the constantly growing proportion of their total expenditures that is going to this class of work. At that time we quoted figures compiled by the Bureau of Railway Economics showing that the railways of the United States spent $573,164,000 for additions and betterments for roadway and structure facilities chargeable to capital expenditures during 1926, or more than in any previous year. We also showed that these expenditures constituted 58 per cent of the total capital expenditures last year as compared with 55 per cent in 1925, 44 per cent in 1924 and 36 per cent in 1923.

The Bureau of Railway Economics has just compiled and made public a further analysis of the expenditures for additions and betterments made during the first three months of 1927 which shows the continuation of these tendencies. In this period the roads spent $155,022,000 for improvements of all kinds, of which amount $99,676,000 went for roadway facilities. This latter figure is an increase of $8,876,000 over the same period of the record year of 1926 and of $28,076,000 for the corresponding period two years ago. Furthermore, the expenditures for roadway improvements comprised 64 per cent of the total for the first three months of this year as compared with 58 per cent last year. The diversity of these expenditures is shown by the fact that $8,275,000 was spent for heavier rail during the first three months of this year as compared with $7,200,000 in 1926, while $10,941,000 was spent for shops and engine houses, including machinery and tools, or $2,741,000 more than last year and $30,145,000 went for additional tracks as compared with $30,900,000 in 1926 in addition to $50,315,000 for other improvements or approximately $6,000,000 more than last year.

The steadily increasing magnitude of the expenditures for roadway facilities indicates the growing realization of railway officers of the possibilities for effecting economies in transportation by modernizing and amplifying these facilities and thereby making it possible to utilize more intensively and more efficiently the cars and locomotives which they already have. The justification of this premise is indicated by the fact that coincident with these liberal roadway improvement programs have come reductions in the operating ratios of the roads and increases in their net earnings.

CAPTAIN KIDD HAS GONE

IT IS NOT the custom to make editorial reference in these columns to the passing of a railway or a railway supply man. Rather, obituary notices are generally confined to the appropriate columns in the news pages. During the last month, however, death has taken a man who occupied such a unique place in the railway maintenance field that departure from this practice is most appropriate. We refer to W. C. Kidd, secretary-treasurer of the Track Supply Association, whose death on July 5 is noted on page 351.

To "Captain" Kidd, as he was familiarly known, belongs the credit for the virile organization of more than 75 leading track supply manufacturers and for the high character of the exhibit of materials and equipment presented each year in connection with the convention of the Roadmasters' association. Still more, credit is due him in no small measure for the progress made by the Roadmasters' association itself, for he worked unceasingly for its interests for many years. He came into the councils of that association when its activities were at a low ebb. Its work had been allowed to decline until interest had almost disappeared and those in attendance at the conventions numbered scarcely more than a handful, while such supply company representation as was maintained was directed almost entirely toward unorganized entertainment with its attending abuses.

At this stage several railway and railway supply men, among them Captain Kidd, realizing the potential possibilities of a strong organization for the promotion of the technique of track maintenance, an activity now involving the expenditure of more than $600,000,000 annually for the railways of the United States and Canada, gathered together a group of serious-minded roadmasters and started the association on a new course. The supply men at the same time organized the Track Supply Association under the auspices of which their activities were diverted from ill-advised entertainment into the conduct of businesslike and educational exhibits of their prod-

ucts. The result is the Roadmasters' association of today, an organization second to none in the railway field in the constructive character of the work that it is doing, while the Track Supply Association's exhibit is second in size in the engineering field only to that of the National Railway Appliances Association in March and equals it in many respects insofar as track materials are concerned. Throughout the 15 years since these activities were reorganized, Captain Kidd wielded a strong influence in both organizations and to him, more than to any other one man, is due the credit for their achievements.

PAINTING A BAROMETER OF PROSPERITY

IT HAS long been known that when railway earnings decline the painting program is among the first to be cut. Likewise, as earnings increase the painting budget is among the last to be restored. Whenever, therefore, a liberal amount of painting work is under way, on any railroad, there is good reason to believe that it is in a fairly satisfactory financial condition. This is the general impression at present for more than the usual amount of painting work is being done this year.

Paint is recognized as a protection for a structure against the agencies of corrosion and of decay. Its application is, therefore, prompted by reasons of economy since it is seldom that painting is neglected sufficiently long to endanger the safety of the structure. Because of this fact, it has been the practice, when it becomes necessary to cut expenses, to sacrifice the painting for other work contributing more directly to safety of operation.

There is another consideration relative to painting, however, which while indirect, is worthy of attention. This is the favorable impression which well-painted buildings make on a railway's patrons and on the public at large. Nothing gives a property a "run down" appearance as quickly as the neglect of painting while, on the contrary, no single measure tends to remove such an appearance as quickly as a coat of paint. Every one likes a neighbor who keeps his property in good condition. Likewise, every one likes to deal with a successful organization. Proper recognition of these tendencies will do much to remove painting from the category of luxuries to be authorized only in periods of relative prosperity and place it in the same class with good track.

ARE LONGER SECTIONS COMING?

WHEN THE track motor car was first introduced not a few railroads attempted to make the cars pay for themselves immediately through reductions in forces. This was accomplished by lengthening the sections and thereby reducing the number of foremen. Many roads went too far in this direction and ultimately restored their sections at least in part, to their original length.

Of late this tendency is again manifest, prompted however by a different motive. It has developed in part from the fact that the rails now used, and other materials to only a lesser degree, are becoming too heavy and too unwieldly for a small gang to handle. At the same time the stronger track construction now found on many roads and particularly the more general use of labor-saving equipment is making it unnecessary to maintain large section forces and the gangs are now no larger and in many instances are actually smaller than 10 or 15 years ago.

As a result of these conditions, it is becoming more and more necessary to "bunch" two or more gangs to do much of the work. This is leading some roads to consider the possibility of extending the lengths of sections, particularly on busy lines, in order to concentrate the forces into gangs sufficiently large to enable them to do unaided any task that commonly arises, other than distinctly extra gang work. With a motor car available for the transportation of the men over the longer section with little added delay, the loss of time is but a slight obstacle which is more than offset by the efficiency that will result by reason of the gang's ability to do its work at the most convenient time without waiting for aid from another gang. Another and not unimportant consideration is the fact that if the money now spent for foremen's wages is divided among a smaller number of men, it will make the position more attractive and draw into the service or retain a higher grade of men, again increasing efficiency.

TAKING THE DRUDGERY OUT OF MAINTENANCE WORK

IT USED to be a common saying that the first and most important requirement of a maintenance of way employee was a strong back. In other words, he must have the ability to perform manual labor, for maintenance of way work has long been almost solely of this character.

The very nature of the work contributes to this. Ties must be renewed, rails must be relaid and stringers must be replaced, and ties, rails and stringers are heavy. Their handling and similar tasks constitute a large part of the work of maintenance of way forces. From the earliest days most of this work has been done by sheer force of man power, aided only by the simplest of tools. This is evidenced by the fact that the typical equipment of a section gang has until recently consisted of only such tools as shovels, picks and tamping and lining bars.

While this department is still no place for weaklings, it is doubtful if many persons, even in this branch of railway service itself, appreciate the extent to which the drudgery has been reduced in recent years. Not many years ago such ditching as was done was performed by hand with shovels; today it is done much more rapidly with ditchers and dump cars and with spreader ditchers. Concrete mixers have replaced the shovel and mixing platform. Materials are handled by locomotive or other types of cranes, while the gasoline-propelled motor car has relegated the back-breaking hand car into the discard. But the end is not yet for new devices are constantly being perfected to lighten the burden and reduce the labor of one operation after another. Typical of more recent developments are the tie tamper, the rail laying machine and the track liner for track men; trenching machinery and the motor-operated trench pump for water service men and the paint sprayers and the electrically driven tools for bridge and building men. Still other devices are appearing daily and are being adopted as their practicability is being demonstrated, with the result that the simple tool equipment of a gang and of a division of a decade or two ago is being transformed into an extensive array of devices.

This development, which is rapidly gaining momentum, is removing one burdensome task after another and is thus making maintenance of way work more attractive. But these facilities cost money. The magnitude of the investments in them is indicated by figures compiled by John V. Neubert, en-

gineer maintenance of way of the New York Central, and published in the September, 1926, issue of *Railway Engineering and Maintenance*, showing that the investment for the larger units of work equipment used on the 3,500 miles of the lines of that railway east of Buffalo, approximated $3,750,000. If to this be added such items as track liners, paint sprays and other smaller equipment, the total investment will exceed $4,000,000. If it is estimated that the other railways of the country are only half as well equipped in proportion to their mileage, the total aggregate investment of the railways of the United States and Canada in equipment to take the drudgery out of maintenance of way work exceeds $400,000,000.

If the railways are to be warranted in making investments of this magnitude, it is not enough that their work be made more attractive to their employees. The roads must also earn a return on the amounts expended for this equipment for they in turn must pay interest on the money which they borrow from those who purchase their stocks and bonds. It is to the mutual interest of employees and employers that this equipment be used in such a manner as to yield the largest possible returns in order that the roads may profit sufficiently from it to enable them to purchase more equipment and thereby still further lighten the laborious nature of the work. Much progress has already been made in removing the drudgery from maintenance work. Still further progress will be made as the employees co-operate with railway managements in increasing the return now being earned.

THE CONTROL OF MOTOR CAR ACCIDENTS

ON APRIL 29 a freight train on the New York, Chicago & St. Louis was derailed by running into a light track motor car, resulting in the derailment of the train and the death of three members of the train crew and the injury of one other employee. While the car in question was operated by a car repairer and his helper, the report issued by the Bureau of Safety of the Interstate Commerce Commission calls attention to the fact that the conditions under which this car was employed are similar to those under which cars of this type are operated constantly by maintenance of way forces. It is pointed out in the report, which is abstracted on page 332, that employees operating such cars are required to "take a chance" when operating these cars, of meeting or being overtaken by trains unexpectedly and the suggestion was made that such cars be equipped with portable telephones. In discussing this accident numerous other suggestions have been made in different quarters, including such drastic expedients as the operation of such cars only under train orders.

More than 50,000 track motor cars are in regular service, principally among maintenance of way forces. They are standard equipment for most gangs. The work of these gangs requires that they move from place to place freely as one task is completed and another undertaken. Any plan to restrict their freedom of movement must, therefore, demonstrate its efficiency in the reduction of accidents sufficient to compensate for the interference created in their work. Many of these cars are used to move men and materials several times daily. Possibly four times is a fair average, making a daily total of 200,000 movements. To attempt to control this number of movements by train order would so overload dispatchers and would so restrict the movement of trains and of the cars themselves as to make consideration of this method utterly impractical.

The use of portable telephones is a more practical expedient which is coming into use on some lines where such equipment is furnished gangs in particularly crooked territories to enable them to "cut in" on the dispatcher's wires and ascertain the location of trains before placing their cars on the track. This measure deserves further and more general adoption, although it has been found in not a few instances where the telephones are used that the "cutting in" on the dispatcher's wires is so frequent as to interfere with their regular duties.

In considering this subject one should give due but not undue consideration to its magnitude. Motor car accidents are very properly the cause of serious concern on many roads. Also, they are increasing on numerous lines. Only a portion of these, however, are the result of collisions with trains. The operation of cars under train orders or the use of portable telephones will not eliminate such accidents as occur from collisions with other track cars, from derailments caused by tools falling off the cars, from collisions with vehicles at highway crossings, etc. In other words, while every accident should be a cause for concern and a subject for investigation, it should not give rise to hysteria.

The most practical method of curbing motor car accidents is to apply adequate supervision and discipline to discourage the "taking of chances." The place to start, as has been stated previously in these columns, is with supervisory officers for it is among them that the accidents are most frequent and the mortality greatest today. Furthermore, these men should set the example, for when supervisory officers themselves violate the rules that have been laid down for the safe operation of motor cars, little criticism can be directed consistently at the employees who likewise violate the rules.

CONCRETE IN TRACK CONSTRUCTION

IT IS, of course, merely a coincidence that the same year has seen the inception of two important experiments in the use of concrete in track construction. At the time that the Pere Marquette was completing the installation of a section of concrete roadbed near Detroit, Mich., the Pennsylvania was installing the first of several thousand concrete cross ties which it has purchased for the first comprehensive test of concrete ties ever undertaken in this country. A description of these ties appear on page 333 of this issue.

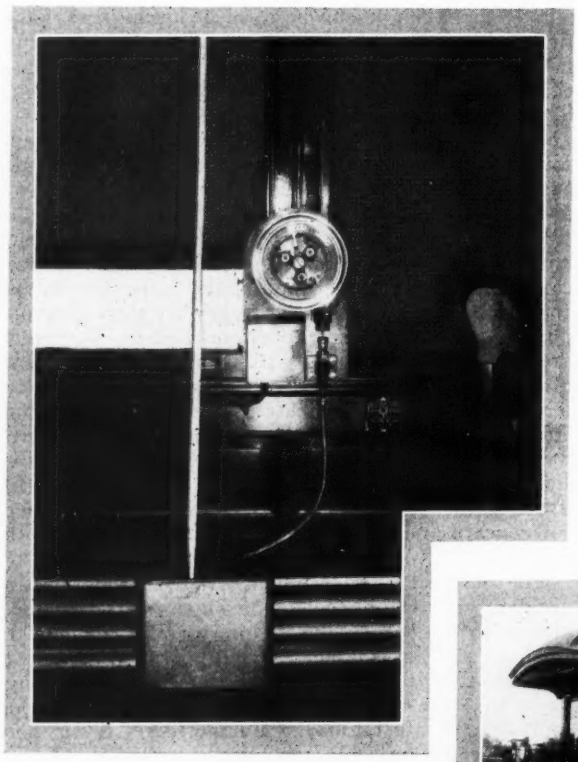
We use the word "test" advisedly because it should be evident to anyone that an installation of concrete ties, even several thousand of them, could not be considered as other than a test installation and the railroads owe a debt to the Pennsylvania for undertaking this experiment, just as they are indebted to the Pere Marquette for the comprehensive test of a concrete roadbed.

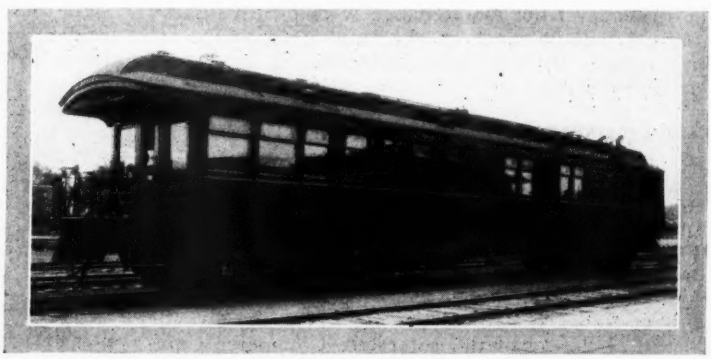
The report of the Roadway committee of the American Railway Engineering Association, presented at the convention last March, contained an exhaustive discussion of the concrete roadbed as a means of developing more permanent track. This report manifested a scepticism which undoubtedly reflects the general feeling among railway officers. There is no doubt that railway men are equally sceptical concerning the possibilities of concrete ties. However, there is reason to believe that these tests are on a sounder basis than any previously made and they will be watched with interest.

A. T. & S. F. Track Inspection Ca

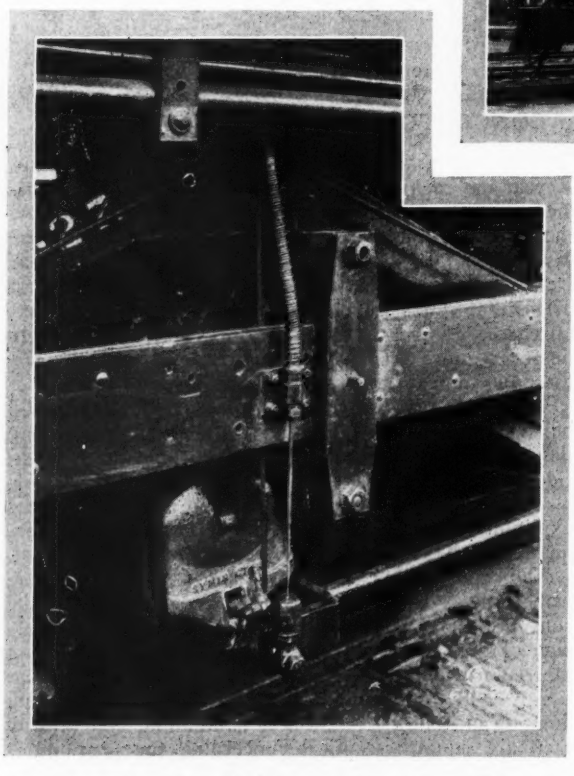
Makes Graphical Record of Various Characteristics of the Track for the Guidance of Track Forces

THE Atchison, Topeka & Santa Fe, after an extended period of study and development, has recently completed and placed in service a track inspection car which records various characteristics of the track graphically. The record is made on a single roll of paper and shows the low joints on each rail, together with the amount that each is low; variations of gage; the lateral movement of the truck and car body with respect to the gage side of the right hand rail; the cross level of the track and the inclination of the car body; the speed of the car and the location of landmarks which are noted as they are passed and from which the other data may be located on the ground. All of this information is





The Santa Fe Track Inspection Car



Low Joints Are Recorded By an Attachment From the Truck (Shown in the Lower View) to Contact Plates Inside the Car

recorded by pens as the paper passes over a platen or table and in addition to the graphical record the total number of low joints of each class is recorded by counters. The mechanism is mounted in a business car with an observation platform, which affords opportunity for visual inspection as the records are being made, and has demonstrated accuracy at high speeds, thus permitting its use on any train on which observation cars are not run and allowing a large mileage to be covered in a short time.

The studies which resulted in the mechanism in its present form were begun in 1914 but due to the interruption caused by the war they were not completed until 1925, the car being placed in service in the fall of that year. A description of the car, prepared by J. de N. Macomb, then office engineer in the office of the chief engineer of the Santa Fe system, and E. E. Chapman, engineer of tests of the same road, was presented as a supplement to the report of the Committee on Rail at the American Railway Engineering Association convention last March, and a brief description was published in the daily edition of the *Railway Age* and *Railway Engineering and Maintenance* of March 9. Since that time minor changes have been made in some of the

Car Has Interesting Features

Gyroscope Has Been Utilized to Record Differences in the Cross Level of the Rails at High Speed

mechanism as a result of the experience gained from the operation of the car.

The record paper is ruled with straight lines to indicate the zero scale for each characteristic, the lines being spaced ⅜ in. apart to furnish a scale by which the variations in track level and the inclination of the car body may be measured. The paper is driven by means of a belt from an axle of the rear truck and by the use of a flexible shaft and a set of reduction gears it is moved over the table in the direction the train is running, at the rate of 13.2 in. per mile of track, regardless of the speed of the train. This corresponds to a scale of 400 ft. to the inch, which is also the scale of standard profile paper, permitting ready comparison with profiles or alinement plats.

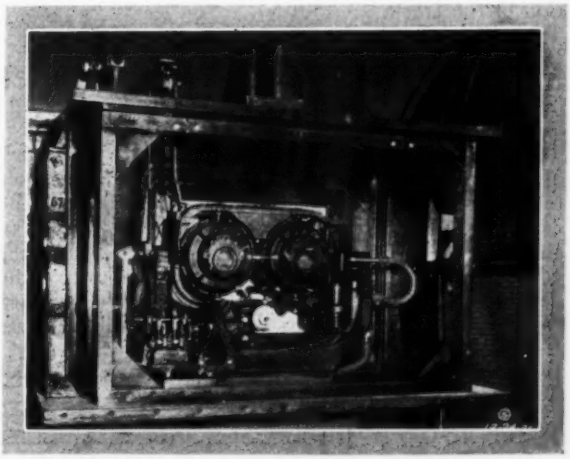
The Graphical Record

Beginning at the bottom of the paper as it passes over the table the first record is a continuous line showing the inclination of the car body, or the "car tilt" as it is designated on the record sheet. This record is one of angular measurement, each ⅜ in. interval between the horizontal lines representing two degrees of inclination. Since a difference of one inch in the elevation of the rails of the track corresponds to an inclination of approximately one degree, a record showing a car tilt in degrees equal to the difference in elevation of the rails in inches indicates that the track level and the car body are parallel. This record is particularly valuable in studying the effects of curve superelevation at various speeds.

Immediately above the car tilt record is that of the cross level of the track, which shows deviations from level on a scale of ⅜ in. to the inch. When this record falls below the base line it indicates that the right hand rail is low, while in case the left hand rail is low the record will appear above the base line. This information is valuable not only to indicate the cross level of tangent track but also to show the amount and regularity of the superelevation of curves, spirals and runoffs.

Speed Is Scaled from Marks at 10-sec. Intervals

Next is a line showing time intervals, distance and location. This line is straight except for short offsets below the line which occur at 10-sec. intervals and which permit the speed at any point to be ascertained by a scale so graduated that the speed is shown by the various lengths between the 10-sec. intervals, the pen being controlled electrically by a clock mounted in the rear of the car. The locations of landmarks, such as mile posts, bridges, stations, etc., are shown by sidewise marks above the time and distance line by the same pen which records the time intervals and which is actuated by a switch operated by an observer on the rear platform, who at the same time informs the attendant at the table the nature



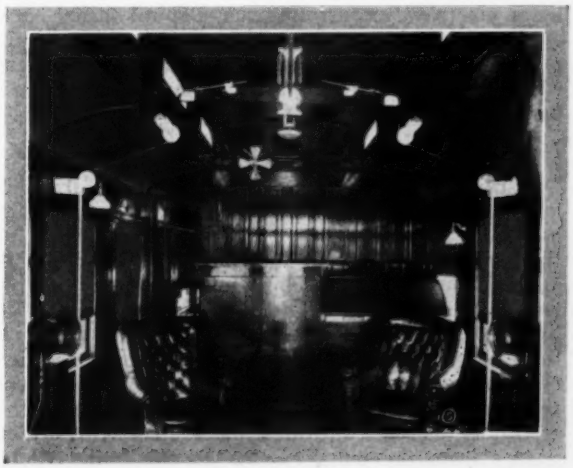
Close-up View of the Gyroscope

of the landmark, both men being equipped with telephone head sets.

Variations of gage are shown to full scale, wide gage being shown above, and narrow gage below the base line. The gage is checked at frequent intervals, where train stops permit, by the observer who uses a master gage for this purpose. Where variations are found to exist between the record and the actual measurement a note is made of the amount and the location where the check was made, the pen being adjusted at the same time. In this way the gage record is kept within reasonable limits, since variations of more than 1/16 in. between the record and the measurements are rarely found.

Low joints are shown by sidewise marks on one of three horizontal lines for each rail, these lines for important high speed tracks representing joints ⅛ in., ¼ in. and ⅜ in. low, respectively, while on less important tracks, the mechanism may be set to show joints ¼ in., ½ in. and ¾ in. low, respectively.

The top line on the paper shows the lateral movement of the truck with respect to the gage line of the right hand rail of the track, the record being shown

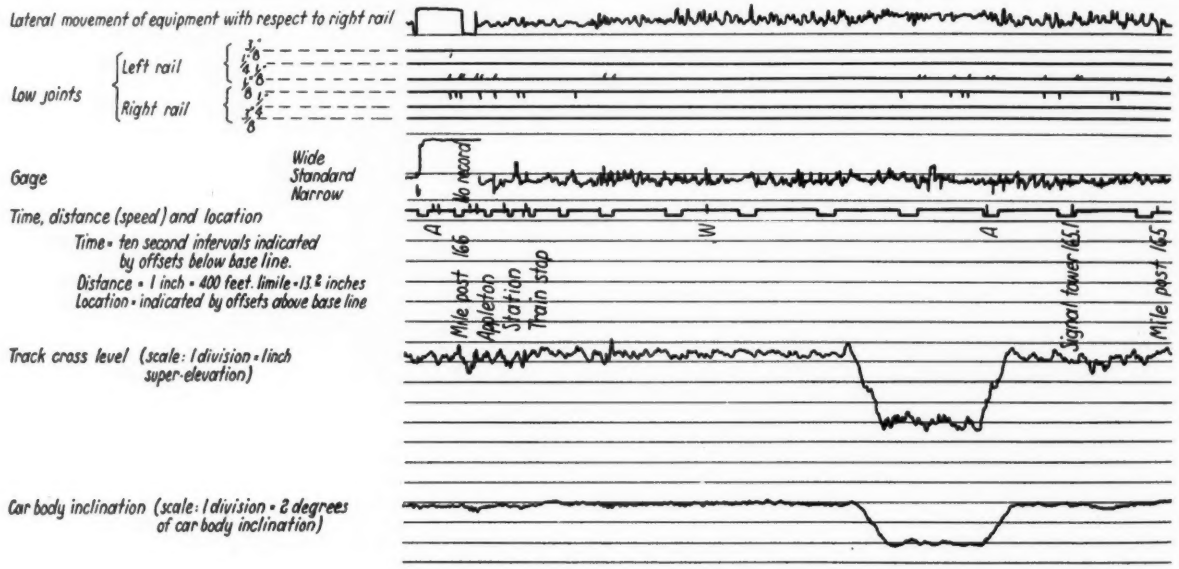


The Cross Beam for Recording the Cross Level of the Track Is Suspended Near the Roof of the Car

at 7/12 of the natural scale. This lateral movement usually cannot be attributed to any one defect in the track but is rather the resultant of low joints and variations in gage, cross level and alinement. It is, however, of value as an index of the general condition of the track.

How the Records Are Obtained

Without attempting to give a detailed technical description of the mechanism by which these records are obtained, a brief description will be of interest. The low joint device is mounted on a six-wheel truck at the rear of the car, the front and rear journal boxes on each side being connected by rigid bars, while the center axle is free to move vertically with respect to the bars. As either center wheel drops below the common level of the end wheels the amount of the depression is recorded by means of a cable attached to the journal box of that wheel. The cable passes up through the floor of the car to a wheel which actuates a lever arm carrying contact rollers running on a circular steel race on which contact plates are so arranged that the amount of the depression of the joint is shown on the appropriate line on the paper by an electrically controlled pen, a spiral spring back of the wheel keeping the cable in tension. The current from each contact plate also actuates mechanical counters which give a cumulative record for each rail over any desired length of track.



A Section of a Typical Record Sheet

Track Gage and Lateral Movement

A continuous record of the gage of the track is made by two wheels six inches in diameter which are held outward against the gage sides of the heads of the two rails by levers to which spring tension is applied, causing the wheels to follow the rails regardless of the variation of gage within any practicable limits. The movements of the levers due to variations of gage are carried to an equalizer bar, which eliminates from the final record all movements except the actual differences in gage. The movement of the recording pen is controlled by a steel wire which passes from the equalizer bar to the frame which holds the pen and makes a full scale record of the deviations.

When the gage-recording device is not in service the wheels and levers on which they are carried may be raised clear of the rails by releasing the air in a special piston which carries the frame supporting the equalizer bar. Trouble is seldom experienced with the gage wheels when passing frogs at a speed greater than approximately 10 miles an hour but it is customary to raise them before passing over facing point turnouts, notice of the approach being given by the observer on the rear platform. Levers are provided at the record table for raising and lowering the wheels, a small air cylinder on each side holding the wheels clear of the rails until they have been lowered into place. The wheels are made of special heat-treated steel mounted on roller bearings and cover a large mileage before it is necessary to renew them.

A record of the side movement of the car between the rails with respect to the right hand rail is also made by the track gage mechanism. Since the distance between the gage points of the car wheel flanges is less than that between the rails, the truck may lurch from one side of its normal position to the other, there being sufficient play in the journal boxes to permit this movement. When the truck lurches to the right the gage wheels remain against the rails, the levers carrying them lean to the right, and the equalizer bar is also tilted with the right end lower. When the truck lurches to the left the levers and equalizer bar are inclined in the opposite direction and the movement of the equalizer bar is utilized to transmit the movement to the recording pen by means of a wire connected to its right end, the record on the paper being 7/12 of the natural scale.

Cross Level Recording Mechanism

The mechanism for recording the cross level of the track was the most difficult to work out satisfactorily. Pendulums as well as "U"-tubes filled with mercury were considered but it was realized that the action of either the pendulum or the liquid in the "U"-tube would depend upon the relation of the speed and the amount of superelevation of the curves and also that the variations in tangent track would so affect these devices that accurate results could not

be obtained readily. Hence, efforts along these lines were abandoned, and experiments were made with the gyroscope. Before they were brought to a successful conclusion the country entered the World War and further studies were discontinued for the time being.

A few years ago, when the studies were resumed, a consultation was arranged with Elmer A. Sperry,

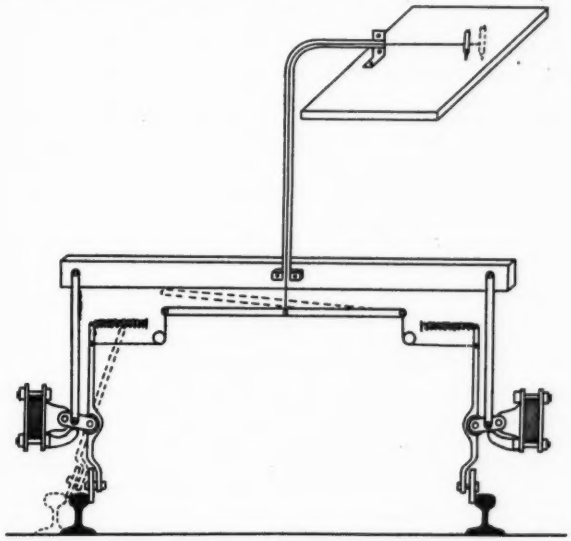


Diagram of Gage Recording Mechanism

president of the Sperry Gyroscope Company, Brooklyn, N. Y., who had developed the use of the gyroscope for ships' compasses, as stabilizers for ships and airplanes, and also for controlling the fire of guns on ships. Investigations revealed that the forces set up when a train rounds a sharp curve at

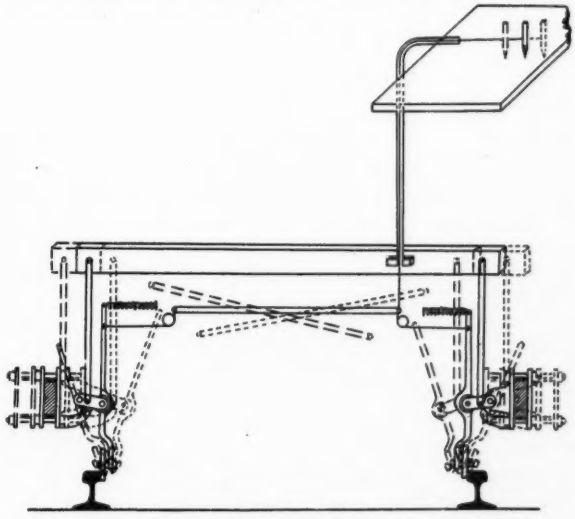


Diagram of Lateral Movement Recording Mechanism

high speed are greater than those encountered on airplanes or ships, but further experimentation showed that it was possible to use the gyroscope successfully on fast trains.

The gyroscope is enclosed in a glass case supported by a bracket attached to the side of the car. It is of the double rotor type enclosed in cases and supported in a gimbal ring which in turn is supported by a frame, the gimbal ring standing in a vertical plane longitudinal with the car. The rotors revolve in opposite directions in a vertical longitudinal plane at a speed of 12,000 r.p.m., the right hand rotor turning clockwise and the other counter clockwise, being connected by gear sectors which require equal movements.

The gyroscope is restrained from moving from its normal position, or is brought back to that position after having been thrown out of vertical by some external force, by an air balancing device which utilizes air from the train line after reducing the pressure to about eight pounds per square inch. The air flows through a divided pipe into two cylinders fitted with pistons and a small pipe leads from each cylinder to separate port valves. Brackets on the rotor cases are so placed that when the gyroscope turns from its normal position, one of the brackets

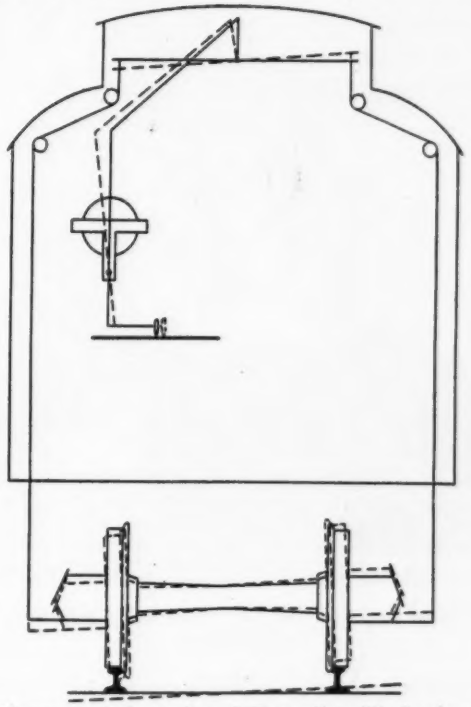


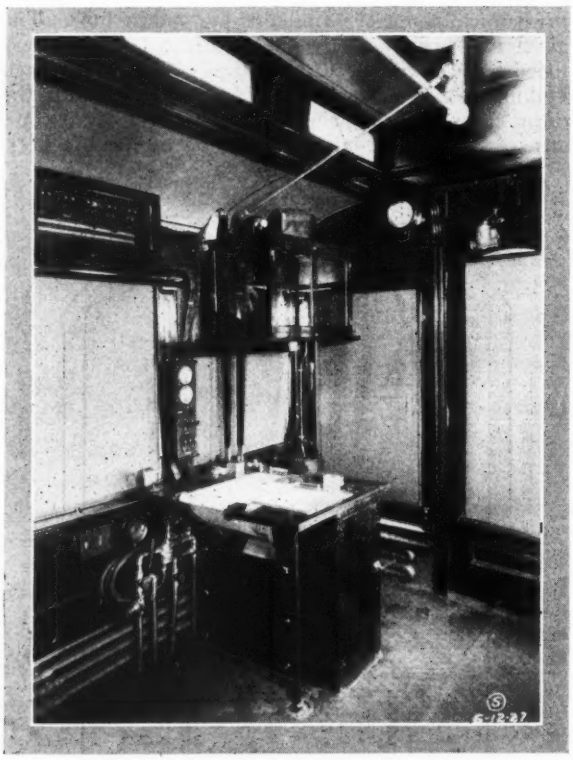
Diagram of Cross Level Recording Mechanism

will cover its corresponding port valve, thus setting up a pressure in the cylinder and forcing the piston downward. This movement of the piston opens a valve which permits the air to flow through a nozzle upon a wheel, causing it to turn and to set in motion a train of gears which causes the gyroscope to return to its original position.

The cross level records of both the track and the car body are made by means of a horizontal cross bar suspended near the roof of the car, and connected by cables to each side of the truck. The bar is free to rotate about its center and moves vertically in a guide, spring tension on the bar keeping the cables tight and causing the bar to follow the exact cross level of the track, regardless of the swinging or bouncing of the car body. A shaft extends from the center of the cross bar longitudinally near the roof of the car to a point near the recording table and thence the movement is transmitted to the recording pen by a system of shafts, levers, cables and bars. The pen bar for the cross level record is connected with the gyroscope in such a way that the car body effect is eliminated and the final record of the pen

shows the difference in level on a scale of ⅜ in. to the inch. Without the corrective influence of the gyroscope the record shown would be the difference in cross level of the track compared with that of the car body.

The control of the gyroscope upon the cross level recording pen is effected by a lever extending from the left upper corner of the gimbal ring upward through the top of the glass case. To the left of this lever is a parallel lever connected to the car inclination pen bar and the cross lever pen bar. For these pen bars to function properly it is essential that the latter lever follow exactly that of the former. Since it is undesirable to attach these levers directly to the gyroscope their movement is controlled electrically.



Interior of Car, Showing Recording Table with Gyroscope Above

Owing to the change of direction on curves the gyroscope will sometimes deviate, producing a trend somewhat out of parallel with the ruled lines on the paper. When this occurs it is easily recognized on the record and the average line is drawn in.

During the present year the car has taken records on approximately 15,000 miles of track, completing this mileage shortly after the middle of June. It is the intention to take records in the spring and fall of each year so that a comparison of the records may show to what extent track conditions have been improved by the season's work. The records are particularly useful in that they are taken under load and often reveal defects which would not be discovered by the use of the trackman's ordinary instruments. They are also useful for comparing various sections or divisions with one another or to determine the relative merits of different track materials, such as rail or ballast, as evidenced by their behavior under load.

Blue print copies of the records are sent to the general and division officers and every effort is made to familiarize the division engineers and roadmasters with them so that they may be used as a basis for programming their work. To this end the division engineers and roadmasters are encouraged to accompany the car while it is on their respective territories so that they may observe the track as the records are being taken and obtain at first hand any information concerning them that they may desire. Arrangements are also made whereby blue prints of the records for individual sections may be obtained by the section foremen, for while some foremen can locate defects with little effort others are not always able to do so and in such cases the record is a distinct aid in showing where the track is most urgently in need of attention. When the records are sent out a sample record containing instructions is also sent as an aid to their use.

In order to ascertain the value of the records a test was made on one district by furnishing the foremen on half the sections with records taken on their track, while they were not furnished to the foremen of the remaining sections. Later records taken over the same district showed that the foremen supplied with the records made the most improvement in their track with a material saving in labor over the sections which had worked without the records, and indicated that considerable economies will result from the use of the records, aside from the improvement in the character of the work.

Statistics from the records may be assembled in tabular form for any desired length of track, showing for each mile the number of low joints, classified by the amount each is low; the number of points where the gage is wide and the number of places where the track is out of level, classified for appropriate amounts. Such a tabulation taken from an actual record is shown for 25 miles of main line track.

	Low Joints—Both Rails			Gage	Gage	Cross Level		
Miles	⅛-in.	¼-in.	⅜-in.	Gage Kinks at Joints, Number	Gage over ¼-in. wide No. Spots	¼-in. or more out of level No. Spots	½-in. or more out of level No. Spots	¾-in. or more out of level No. Spots
557-558	0	0	0	16	0	22	3	0
558-559	1	1	0	27	2	25	3	0
559-560	4	1	0	19	5	31	7	1
560-561	0	0	0	10	0	29	0	0
561-562	9	0	0	21	0	29	0	0
562-563	6	0	0	33	1	28	0	0
563-564	3	0	0	24	0	26	0	0
564-565	4	0	0	16	0	34	0	0
565-566	12	4	2	16	3	31	4	0
566-567	2	0	0	6	0	18	0	0
567-568	0	0	0	9	0	13	0	0
568-569	3	0	0	17	0	31	0	0
569-570	0	0	0	23	0	20	0	0
570-571	4	2	0	31	2	38	0	0
571-572	7	0	2	42	3	39	0	0
572-573	5	0	0	36	1	54	0	0
573-574	3	2	0	41	2	29	0	0
574-575	9	1	0	30	2	32	0	0
575-576	3	0	0	19	0	5	0	0
576-577	5	1	0	21	1	3	0	0
577-578	6	1	0	35	0	4	0	0
578-579	10	1	0	24	1	15	1	0
579-580	11	1	0	24	0	9	0	0
580-581	12	1	0	51	2	14	0	0
581-582	7	2	0	41	3	14	0	0
Total	126	18	4	632	28	593	18	1
Average per mile	5.0	0.7	0.16	25.3	1.1	23.7	0.7	0.04

While it is the practice to operate the car only during daylight hours it has been operated at night where delays would otherwise disarrange the schedule for its movement which is made out in advance of its assignment to any given territory. When night operation is necessary electric spotlights are used to assist the observer on the rear platform to

pick up and identify the landmarks along the track.

The car carries an operating force of three men, one being in charge, with two assistants. The attendant at the record table and the observer alternate in their duties, not only to relieve the monotony but also that they may become familiar with all phases of the work and to avoid delays in cases of emergency. Living quarters are provided on the car, with an attendant who prepares the meals and takes care of the car. When a meal is served while records are being taken the various members of the force are relieved one at a time so that no interruption occurs.

The mechanism is inspected carefully at the end of each day's work and all ordinary repairs and adjustments are made at that time, a sufficient supply of spare parts being carried so that no delays occur except in the case of major accidents. Electric current is supplied from a large storage battery charged by an axle-driven generator.

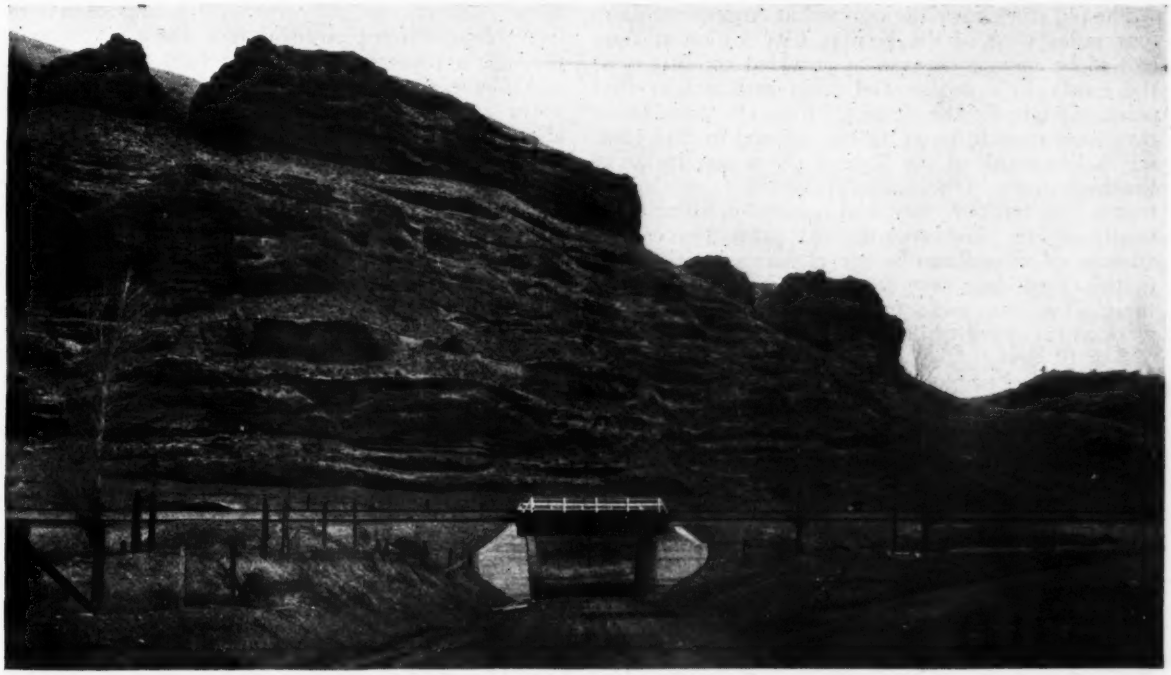
The car was developed by C. F. W. Felt, chief engineer of the Santa Fe System, assisted by J. de N. Macomb, then office engineer in Mr. Felt's office, and by E. E. Chapman, engineer of tests. As has been said above the adaptation of the gyroscope to the car was worked out by Mr. Sperry, who also devised the cross level bar as well as the recording table. L. F. Carter, Mr. Sperry's assistant, supervised the installation of these devices, and Paul W. Steelsmith, of the Santa Fe's test department, who is in charge of operation of the car, participated in its design and construction and also worked out the changes which have been made in the mechanism since the car was placed in service. T. A. Blair, formerly assistant engineer in the engineering department, who was later a roadmaster and is now division engineer of the Panhandle & Santa Fe, a subsidiary of the Santa Fe, did much work in developing the uses of the records in connection with track maintenance.

D.T. & I. Adopts System for Numbering Side Tracks

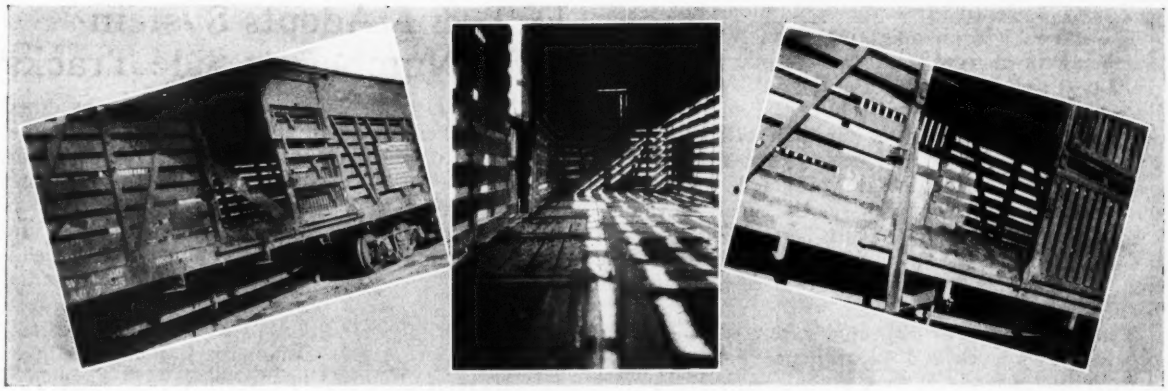
THE Detroit, Toledo & Ironton has assigned numbers to all of the side tracks on its line, identifying each track on the ground by an aluminum plate which bears the number of the track in figures three inches high and which is nailed to the headblock of the switch. The numbers assigned by the Bureau of Valuation of the Interstate Commerce Commission in its inventory of 1918 have been adopted for the tracks which were in existence at that time and additional numbers have been assigned to tracks which have been constructed since. Under the practice of the commission side tracks were numbered consecutively, beginning with No. 1 at each station, and identified by marking these numbers either on station plats or on sketches in the field notes.

A Side Track Number on the D. T. & I.

Confusion often results from the use of local names for tracks at the various stations and it is expected that the new system will not only eliminate the chance for misunderstanding which exists when such names are used in correspondence in the maintenance of way department, but that it will be of assistance to other departments as well in designating tracks or structures. The system may not be of any particular value at the present time at small outlying stations but it was felt that if the practice were adopted it should cover the entire road. Over 2,000 of these number plates have been applied to date.



Picturesque Rock Formations Along the Union Pacific in Utah



At Sides: Stock Cars Before Being Cleaned. Center: Floor of Car After Cleaning

A. T. & S. F. Installs Stock Car Washing Plant

Use of High Pressure Hose for Removing Bedding Has Increased Capacity and Effected Economies

By A. W. JOHNSON
Supervisor of Water Service, Atchison, Topeka & Santa Fe, Topeka, Kan.

DURING 1926 the Atchison, Topeka & Santa Fe installed a stock car cleaning plant at Morris, Kan., 10 miles west of the Kansas City Union station, where the cars are cleaned by washing with high pressure hose streams. The plant was constructed to improve operating conditions in and out of Kansas City, to effect a saving in the cost of cleaning and general maintenance of stock cars and to provide for greater capacity than was afforded by the old facilities used for this purpose.

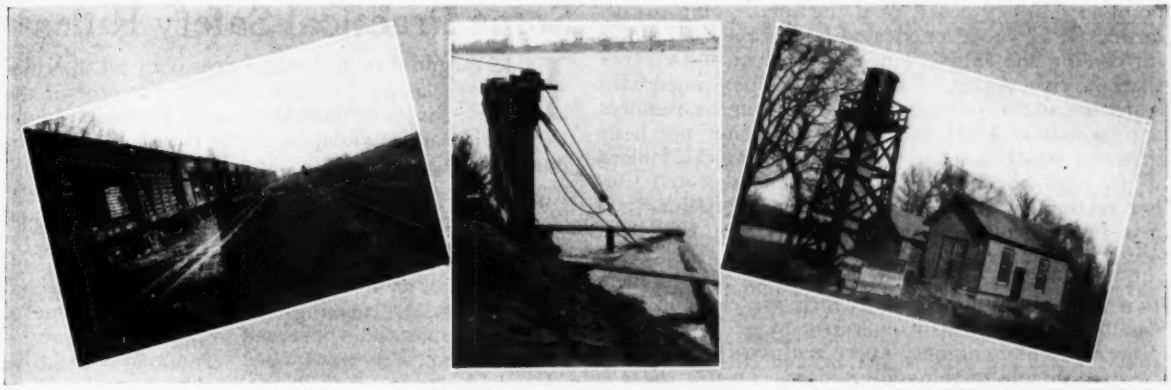
The old stock car cleaning yard at Argentine, Kan., four miles west of the Kansas City Union station, had to be moved because of crowded conditions at the Santa Fe's engine and train terminal at that point. Originally the cleanings from stock and other cars were used to build up low ground in this yard, which lies south of the Kansas river, just inside of the high water dyke, and this practice, carried on over a long term of years, had resulted in filling practically all the low ground. At present a certain amount of miscellaneous car cleaning is still done in this yard, but very few stock cars are cleaned there. Two men and a foreman now take care of the work at this yard while formerly the gang consisted of 8 or 10 men.

The method employed in cleaning stock cars at the old Argentine yard was practically all fork and shovel work and only the finishing was done by washing with a hose. A gang of nine men, one acting as foreman, would clean on an average about 13 cars in eight hours and, in some instances where the material in the cars had accumulated to a depth of 10 or 12 in. and was badly matted and caked, only six cars per day would be cleaned.

Description and Operation of New Plant

The new plant is located west of Morris between the Kansas river and the three-track main line. This ground is lower than the level of the main tracks and, for the present, all waste material from the cars cleaned will be used for filling up to grade. There are three storage tracks, each about 4,000 ft. long, in addition to the two cleaning tracks which are about 3,500 ft. long. Between the two cleaning tracks, which are 30-ft. center to center, there is 3,182 ft. of 6-in. and 8-in. bell and spigot, class "D," cast iron water line which is connected to the pump at the river by 354 ft. of 10-in. pipe line. There are 66 hydrants located along the pipe line at approximately 50-ft. intervals, each hydrant consisting of a two-inch wrought iron pipe rising from the cast iron main through a creosoted timber pit to a height of two feet above the ground. Each riser has a shut-off valve near the main and a 1¼-in. hydrant valve above the ground. The cleaning tracks have a capacity of 150 cars, each of which can be reached from some one of the hydrants. A six-inch tile drainage line having several outlets to the river is laid between the cleaning tracks, with laterals every 25 ft. extending under each track.

The pumping equipment at the river consists of an 80-hp. Fairbanks-Morse Diesel type oil engine and a 4-in. four-stage Worthington centrifugal pump, designed for a discharge of 400 gal. per min. against a 400-ft. head. The plant was designed to operate six water streams of about 70 g.p.m. at 150-lb. pressure through ⅜-in. nozzles. However, in actual practice, the best results have been obtained by using five men as washers, each having 100 ft. of 1¼-in. rubber hose with a ½-in. nozzle on which a ⅜-in. tip can be placed. The foreman assists the washers by turning the water on and off and also does some shoveling in the cars and spreading waste material. With the four or five ½-in. nozzles open, the water pressure remains at 150 lb. or more and the discharge amounts to from 100 to 125 g.p.m. through each nozzle. With this method a gang of five men, with a foreman, will clean an average of 30 cars in eight hours. There are cer-



Left: Narrow Gage Track for Disinfecting Cars. Center: Intake at the River. Right: Pump House

tain seasons when it is necessary either to put on more men or to operate two eight-hour shifts to take care of the cleaning work.

With labor at $0.35 per hour, the cost for cleaning one car, based on the average performance for the two methods described, is $1.94 when done entirely by hand and $0.57 with the washing plant. The latter figure must, of course, be increased to take into account the cost of operating the pumping plant, as

Stock Cars Being Cleaned by Washing

well as the overhead charges on this equipment which are approximately as follows:

Plant operator, one month	$175
Fuel oil, 900 gal. at $0.07	63
Lubricating oil, 30 gal. at $0.30	9
Repairs	25
Interest and depreciation on investment, exclusive of trackage; $38,600 at 9 per cent	289
Monthly operating cost	$561

Based on an average daily cleaning capacity of 30 cars, this operating and overhead expense amounts to $0.72 per car which, added to the $0.57 labor cost, makes a total of $1.29 per car for cleaning, as against $1.94 by the old hand method, or a saving of $0.65 per car. It is estimated that out of 40,000 cars of stock moved into Kansas City per year, 10,000 require cleaning. In addition to the saving effected in cleaning expense, there will be the more intangible savings, such as lower car floor maintenance costs and fewer damage claims for injuries to livestock.

Another feature which ultimately will be included in the operation of this plant is the disinfecting of the use of a 125-gal. tank mounted on four hand-car wheels. The tank is filled with 120 gal. of water and 5 gal. of Creosol and then put under a pressure of 100 lb. per. sq. in. by compressed air piped from the engine house. This permits application by the use of sprays. This outfit is pushed from car to car along a narrow-gage track which lies between the two cleaning tracks. Two men with one of these outfits will disinfect 10 or 12 cars per hour.

The application of a new bed of clean sand in the cars is not done at Morris at present, but at Argentine. One bedding requires about one cubic yard of fine sand and three men will bed one car in 30 min.

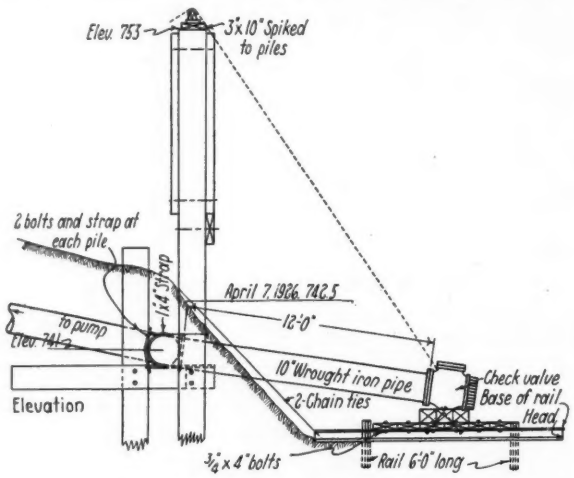
Details of Construction and Design

Water for washing purposes is taken from the Kansas river, the pump pit being located about 90 ft. from the edge of low water. The suction line is about 140 ft. long, composed of 10-in. bell and spigot, class "B," cast iron pipe, except at the river end, where wrought iron screw pipe is used. Two 90-deg. screw bends at the water's edge permit the raising or lowering of a 10-ft. length of pipe which extends into the water. On the outer end of the suction line is a 10-in. flanged, horizontal check valve with a cast iron strainer over the end and as an additional protection against trash getting into the pump, there is a 10-in. Elliott twin strainer on the suction of the pump in the pit. During low water the suction lift is 15 ft. and the check valve rests on a submerged wooden platform. Three piles at the water's edge, driven to stand 16 ft. above low water, act as a sheave rest for the lifting cable which is operated by a small winch set up on the high bank away from the river.

The floor level of the reinforced concrete pump pit is 21.5 ft. below the floor of the engine room. The pump is belt-driven from a 48-in. pulley on the engine, operating at 300 r.p.m., to a 10-in. pulley on the pump, giving a pump speed of 1,440 r.p.m. The belt distance is 35 ft. center to center of pulleys and the pump house is connected with the pump pit by a reinforced concrete beltway built on an incline. In addition to the four-inch, four-stage centrifugal pump in the pit, there is a four-inch Gould Pyramid pump driven by a belt from the extended shaft of the large pump, which is used for pumping ground water from four well points into an elevated tank, 6 ft. in diameter and 8 ft. high, holding 1,700 gal., from which cooling water flows by gravity to the engine. The piping connections are arranged so that water from the discharge of the big pump can also be put into the cooling water tank, in case the well cars which have been condemned by government inspectors at the stock yards. This work is done by

points are out of order, or if the small pump breaks down. It is, however, desirable to have well water for cooling the engine, since it is colder and cleaner than the river water. Each pump can be primed with water from the cooling tank. The engine requires approximately 1,600 gal. of cooling water per hour in warm weather. The tower supporting the tank is 27 ft. high, made of 2 in. by 10 in. creosoted timber resting on 10 in. by 10 in. posts, 7 ft. long, set 5 ft. in the ground, with a platform 24 in. by 24 in., 4 in. thick under each post.

The engine is started by compressed air stored in two 18-in. by 50-in. tanks, which are charged by a small Rix compressor operated by a three-horsepower gasoline engine. There are two fuel oil tanks located outside of the engine room. One of these is an old tank car body, with a capacity of about 8,000 gal., which is buried in the ground, at a distance of 278 ft. from the nearest track. A 3-in. galvanized



Details of Intake at the River

wrought iron pipe leading from this track to the tank, is used for the unloading of the distillate fuel oil by gravity, this method of handling permitting the purchase and delivery of fuel oil in car lots. The other fuel tank holds 200 gal. and supplies the fuel pump on the engine. The small tank is filled from the large one by a Bowser hand pump.

The engine house, pump pit superstructure and connecting runway are of frame construction. Lockers and washing facilities are provided in one end of the engine room. A connection on the discharge of the pump provides fire protection.

This work was handled under the direction of H. W. Wagner, chief engineer, Topeka, Kan., C. M. Buck, division engineer, Emporia, Kan., and A. W. Johnson, supervisor of water service at Topeka, Kan.

The Union Pacific Passenger Station at Fullerton, Cal.

Some Practical Safety Rules*

IT IS essential that all employees obey all the rules and special instructions since 95 per cent of the injuries to trackmen are caused by unsafe practices which are in violation of the rules and are often due to thoughtlessness. Supervisory officers should see that all rules and special instructions are obeyed and when they are violated should investigate and discipline the offenders. All personal injuries, regardless of how small they may be, should be bulletined and also brought to the attention of all concerned at safety meetings. Following are some of the precautions to be observed to prevent injuries.

Only men who have been examined should be placed in charge of track cars. The cars should be inspected daily for loose bolts and defective wheels or brakes. No repairs or adjustments to motor cars should be made while the car is moving or the engine is running. Tools should be placed on the car in such a way that they will not fall off and cause a derailment, since such derailments often have serious results.

All men should clear the track for passing trains on the same side with the foreman, to a distance of not less than 20 ft. While the train is passing, all the men should watch for hot wheels, hot boxes, dragging equipment or shifted loads, and when any of these are discovered the train should be stopped, if necessary to prevent an accident.

When a tool becomes defective it should be taken out of service immediately and all defective tools should be tagged "Bad Order" so that they will not be used. Men driving nails, cutting rails, bolts or other metal, or grinding tools on emery tool grinders should wear goggles.

The men should not be permitted to work too close together on the track and special care should be taken in handling rails and ties. More injuries are caused by handling ties than rails, since the men are more cautious when handling the latter, but injuries caused by rails are usually more serious. When handling either of these materials the men should be taught to watch each other and to have a full understanding as to the manner of doing the work.

Track walkers should be examined by the roadmaster so that he may know that they understand the flagging rules. They should walk against the current of traffic on double track and on windy or stormy days should walk where they will be clear of the track.

Only men who understand the flagging rules and can be trusted to obey instructions should be selected as flagmen.

High weeds should be mowed at all highway crossings so that they will not obstruct the view of vehicles.

When boards with projecting nails are found the nails should be bent over.

All the men, from section laborer up, should be educated to think of what they are doing and to avoid unsafe practices. If any man makes light of these efforts and is careless as to the safety of himself and others, he is just the man to drop from the service. Safety meetings, with representatives from all departments, should be held monthly. If these things are done and an interest is taken in seeing that the rules and special instructions are observed a great reduction can be made in personal injuries.

*Abstracted from an article by W. A. Davidson, roadmaster, Union Pacific, Kearney, Neb., in the July issue of the Maintenance of Way Foreman (Union Pacific).

C. M. & St. P. Equips Rail Gangs with New Tool Cars

Economy of Space, Accessibility and Work Shop Facilities Are Features of the Equipment

THE Chicago, Milwaukee & St. Paul, which last year inaugurated the practice of assigning one large rail relaying gang to each general superintendent's district, has increased the effectiveness of these gangs by providing them with new tool cars. These cars have been designed to give the rail gangs the practical equivalent to the usual tool room service in a shop. Special attention has been given to the arrangement of bins and racks for the most practical storage of each kind or class of tools, taking into account not only that the tools must be held securely in place while the car is in transit but providing also for maximum efficiency and prompt service in issuing the tools to the men, as well as for the accurate and rapid checking of the supply on hand. Like the tool room in a shop the cars are equipped to keep the tools in condition for use. A bench is provided for minor repairs and a power as well as a hand grinder afford means of keeping edged tools sharp.

To accomplish these desired results the cars are fitted with racks, shelves and bins to accommodate the tools with a minimum of space. Shovels, adzes, spike mauls, picks and similar tools are hung in slotted racks; a bin is provided for lining bars and claw bars which permits them to be stood on end with no danger of falling over, and storage space is provided for the bulkier tools and accessories, such as track jacks, rail drills, level boards and gages.

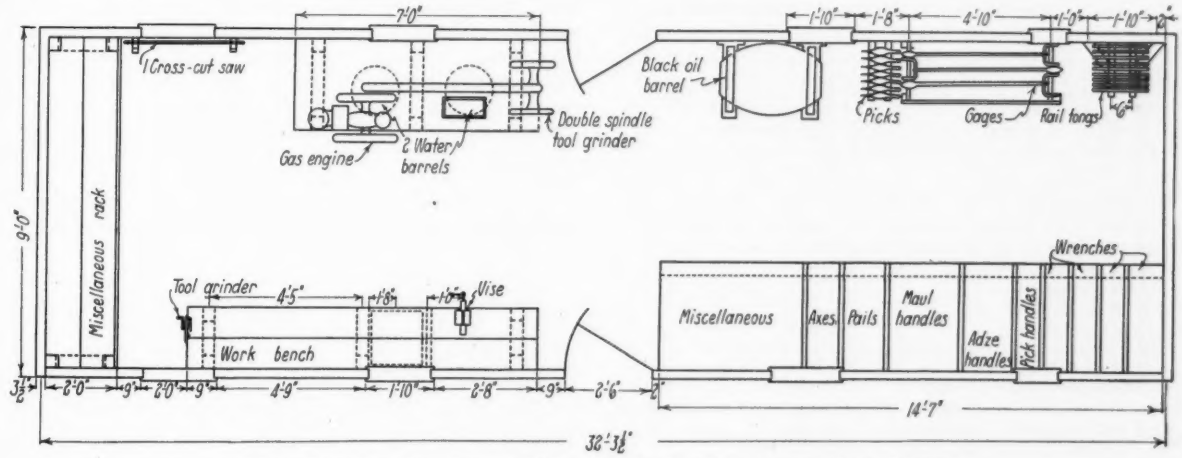
Tools are Stored in Special Racks

As will be seen by the plan the space on one side from the center door to the end of the car is occupied by racks to accommodate 90 shovels, 48 adzes, 18 swedges and 48 spike mauls, or a total of 204 of these various tools. These racks extend three feet from the side of the car and are floored over with 2-in. lumber at a height of 5 ft. 2 in. above the car floor to form a storage space for track wrenches, extra tool handles and miscellaneous material which cannot be hung in the racks. The spaces for the various articles are separated by low partitions of 2-in. by 6-in. timbers set on edge and extending from the face of the racks to the side of the car. A roof of 2-in. plank, sloping to the side of the car, covers this space to protect the material from possible leaks in the roof.

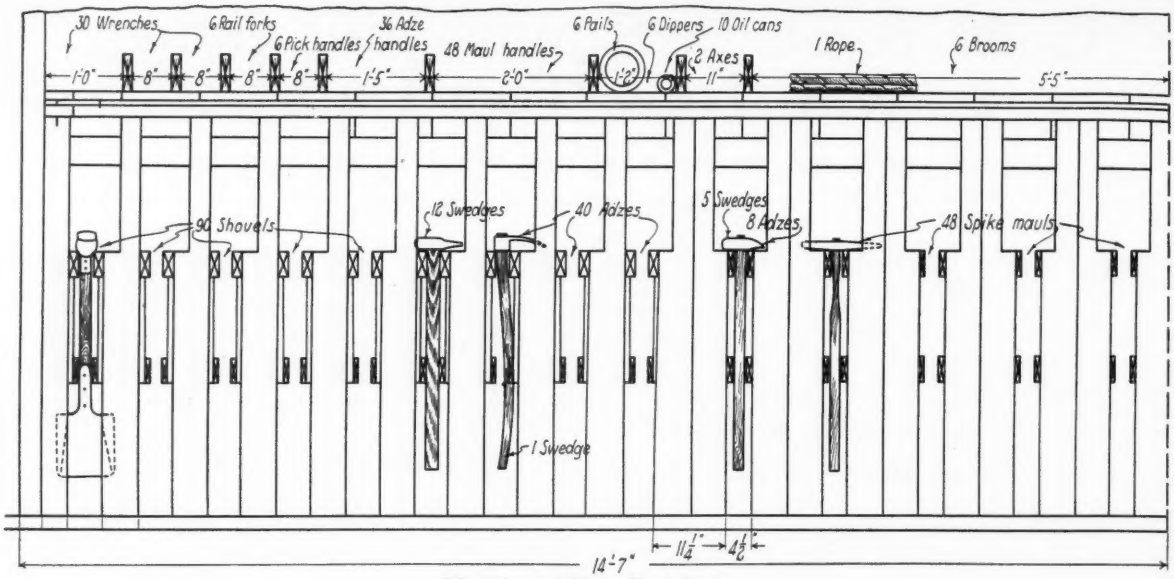
Bins and Shelving Also Provided

Directly opposite the racks just described are other racks and bins for lining bars, claw bars, sledges, track jacks, track drills, track gages, and level boards. Above the storage space for these articles are two racks attached to the side of the car, one for holding picks and the other for rail tongs. Between the storage space and the center door on this side of the car are blocks for supporting a barrel of black oil. These blocks are bolted securely to the floor of the car and their surfaces are recessed to hold the barrel, metal straps being provided to hold the barrel in place while the car is in transit.

The space across the other end of the car is occupied by shelving for storing various tools and articles as shown. On one side of the car, between the shelving and the center door is a work bench equipped with a vise and a hand operated tool grinder, while directly opposite is another bench on which is mounted a double-spindle tool grinder driven by a six-horsepower gasoline motor car engine, the exhaust of which is piped through the floor to the outside of the car. With this device it is possible to sharpen all the adzes used by the gang while the men are eating their midday meals and after the gang has quit work in the afternoon. This arrangement has been found particularly useful in insuring a plentiful supply of sharp adzes at a small cost, since the work is done by the man in charge of the car, who also replaces broken handles and makes such



Floor Plan Showing Top of Main Tool Rack at the Lower Right Corner



Elevation of Main Tool Rack

repairs to the tools as can be done in the field, besides receiving and issuing the tools.

All of the racks and bins in the car are made of dressed lumber and these as well as the walls and roof of the car are painted, a brown color being used on the lower portions and a light yellow above. Windows provide ample natural light and the car is heated by a cast iron caboose stove.

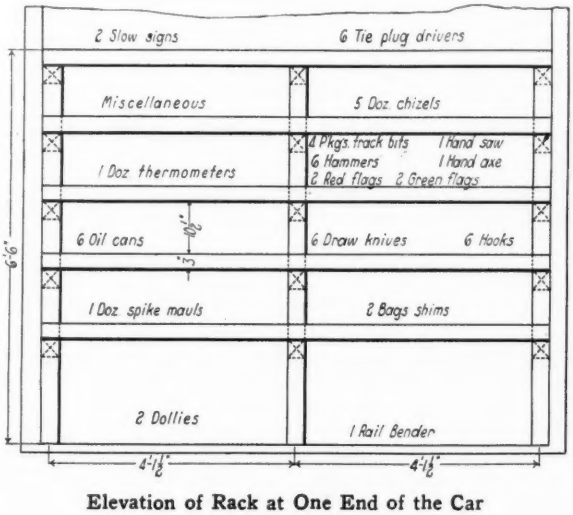
Each of the cars was sent out equipped with a complement of new tools for a rail laying gang of 100 men, as shown in the accompanying list.

32 Claw bars
12 Lining bars
36 Handled adzes
24 Adze handles
6 Brooms
12 Rail tongs
6 Rail forks
6 Tie plug drivers
48 Handled spike mauls
36 Spike maul handles
6 Handled picks
6 Pick handles
75 Track shovels
18 Barrett tie plate swedges
2 Rail dollies
2 Ratchet track wrenches, 12-in., for 1-in. bolts
4 Ratchet track wrenches, 24-in., for 1¼-in. bolts
12 Common track wrenches, 24-in., for 1-in. bolts
2 Common track wrenches, 24-in., for 1¼-in. bolts
2 Monkey wrenches, 12-in.
1 Sampson rail bender
48 Track chisels
12 Sledges, 16-lb.
6 Three-knob spike pullers
2 Track drills
12 High speed drill bits, 1⅛-in.
2 High speed drill bits, 1⅛-in.
2 Simplex track jacks, No. 217
2 Track jacks, No. 6
4 Level boards
4 Track gages, insulated
1000 Rail shims, ⅛-in.
250 Rail shims, ⅜-in.
12 Thermometers
2 Slow boards
2 Red flags
2 Green flags
48 Torpedoes
2 Tape lines, 50-ft.
2 Water kegs, 20-gal.
6 Water pails
6 Water dippers
6 Motor car trailers
2 Light push cars
1 Barrel black oil
1 Oil can, 1-gal.
6 Hand car oilers
2 Single bitted chopping axes
1 Hand axe
1 Hand saw
1 Cross cut saw
1 Draw knife
1 Wood rasp, 14-in.
4 Flat saw files, 12-in.
2 Triangular saw files, 8-in.
6 Machinist's hammers
1 Tool grinder, hand operated
1 Tool grinder, power driven, with engine and belt
1 Bench vise
35 ft. Manila rope, 1¼-in.
4 Paint brushes, flat, 4-in.
1 Tool box, 3 ft. by 3 ft. by 7 ft., with lock
1 Tool box, 3 ft. by 3 ft. by 4 ft., with lock

For gangs laying 130-lb. rail the following tools are provided in addition to those shown above.

2 Common track wrenches, 24-in. for 1¼-in. track bolts
2 Common track wrenches, 24-in. for 1⅜-in. track bolts
2 High speed drill bits, 1⅛-in.
2 High speed drill bits, 1⅜-in.

These cars have demonstrated their efficiency since they have been placed in service and have reduced to a minimum the task of taking care of the tools and other equipment incidental to the work for which they are provided. It is said that the one man in charge of the car can issue tools to the gang faster than could two men in the cars formerly used. The work bench enables the tool man to make many repairs which were not practicable under the old arrangements and the location of the various racks



Elevation of Rack at One End of the Car

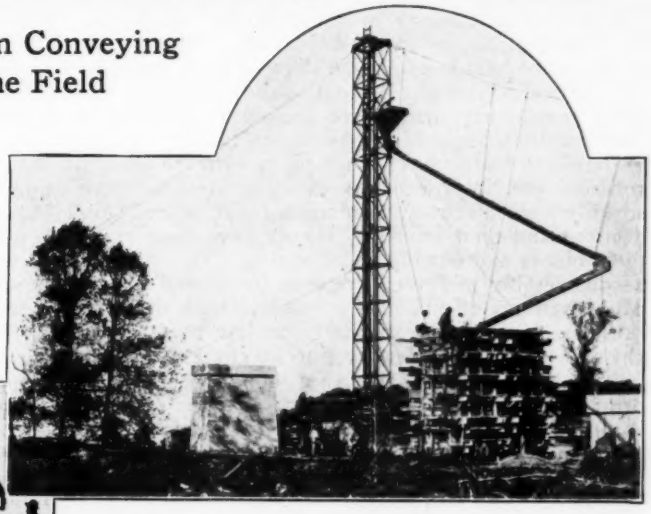
and bins is such that the storage space does not interfere with the space assigned as a workshop.

Old 32-ft. box cars were utilized for these tools cars, being fitted up in the company's shops according to plans drawn up under the direction of W. H. Penfield, engineer of maintenance of way, and William Shea, general roadmaster, respectively, of the Chicago, Milwaukee & St. Paul.

Better Methods of Handling Concrete*

Some Sound Advice on Practices in Conveying and Placing for the Man in the Field

By NELSON L. DOE
Turner Construction Company, New York



Past and Present in Handling Concrete

THERE ARE two common forms of mixers in general use: The mixer which is discharged by means of a chute, pivoted so as to swing into the center of the drum; and the tilting drum type. The former is by far the more universally used. In selecting a mixer of this type, care should be taken to see that the chute when in the discharging position has pitch enough so that concrete of a stiff consistency will slide along it without accumulating to block the opening from the drum, otherwise the tendency is to add water to the mix until it can be discharged without difficulty. The discharge should be so arranged that the operator can inspect the batch without tilting the chute at such an angle that the weight of the outpouring batch prevents the returning of the chute to the normal running position, in case the batch requires a slight change in consistency. The chute should be so designed that the mixer can be emptied quickly, for when a large volume of concrete is carried there is less tendency for it to separate. Chutes should extend well into the center of the drum, past the line of dippers; otherwise the batch will be discharged with either the heavy aggregate first, or last, or it may not be discharged completely.

Advantage of Tilting Mixer

Concrete having considerably stiffer consistency can be discharged from a tilting mixer, in less time than from the chute-discharging type. This is a distinct advantage and is one of the chief attractions of the tilting machine.

The discharge from either type of mixer should be arranged so that the concrete will not travel any considerable distance nor spread out across any sloping surface. The discharged concrete should not slide down the side of the receiving box or bucket. It should be poured into it, striking near the center and with approximately a vertical fall. If this action takes place, there will be little segregation of aggregates.

A bucket which discharges through a gate at the bottom causes much less segregation of aggregates than the buckets which unload by dumping the concrete over the edge. This is a decided point in favor of the pyramidal type of bucket. A batch of concrete of ordinary consistency improperly chuted from the mixer into a bucket of this type with noticeable segregation will be discharged through the gate in the bottom partially remixed. If interest in controlling the quality of concrete continues to increase, it would not be surprising to see the top-dumping bucket disappear entirely in favor of the bucket which dumps through a bottom gate.

Hoppers so designed that a swirling action or eddying of the mass is noticeable should be corrected, for whenever this takes place the aggregates tend to separate. Gates should shut tight and quickly, otherwise rich material wastes away, leaving coarse aggregates against the gate.

Proper Loading and Unloading

Although the actual hoisting of concrete in buckets has little effect on quality, improper loading or unloading of the bucket will cause segregation, and these features should be carefully arranged. The less concrete is handled the less segregation and the more uniformity in the deposited concrete. The moving of concrete a few feet in an improper manner may affect its quality more than properly conveying it long distances.

Possibly in the past, chuting operations have justly deserved some of the adverse comment they have received. With modern ideas of water control and consistency, most of the objections to chuting concrete from the standpoint of quality have been automatically removed. Concrete of proper consistency can readily be chuted. Concrete of a very wet consistency cannot be chuted without marked deterioration. These facts are a strong argument in favor of chuting concrete, for chuting furnishes a check on the consistency of the concrete. With given materials, the limiting angles of distributing chutes can readily be ascertained after the action of a few batches has

*Abstracted from a paper presented before the convention of the American Society for Testing Materials at French Lick, Ind., on June 20 to 24, 1927.

been studied, and once the chutes are erected accordingly, little segregation is experienced.

Different aggregates and chutes produce different effects on the velocity of the concrete carried, so these limiting angles vary considerably. Gravel concrete will be best handled at a slope of approximately one vertical to three horizontal, while concrete of the same consistency made with broken stone or slag may require a slope of nearly one to two.

Details of chutes have much to do with the flow of concrete and improvements in chute designs have steadily been made. The increased size of end connections and their improved shapes have done much to eliminate overflowing and clogging. This permits a considerably stiffer concrete to be carried safely. More harmful effects may result in chute distribution due to improper discharge at one point along the line than in the entire line of chutes properly adjusted. A proper receiving hopper should be provided at the end of the chutes; or if the concrete is placed directly in the forms, it must not fall freely more than a few feet, or be shot out at an angle. Long runs of chute should always discharge into a hopper having a bottom gate.

Conveying with Two-Wheeled Carryalls

From a practical point of view there is little to criticize regarding this method, although study shows that concrete transported by carryalls segregates en route. Due to the different specific gravities of the materials and the vibration of wheeling, all heavy aggregates tend to settle while the fine material and excess water rises to the top of the carryall. In batches of wet consistency, segregation is more pronounced than in batches of ordinary consistency.

Tests indicate that concrete placed in the forms by wheeling in carryalls will be segregated to such an extent that variations from the mean strength of 20 per cent will not be unusual. The redeeming feature of this, however, is the fact that each carryall contains less than six cubic feet of concrete, hence no great volume is affected. As each carryall is placed in the forms the opportunities for remixing are present, so that while segregation during transit may help to explain non-uniformity of field tests, the strength of the concrete over any considerable area is probably quite uniform.

Concrete discharged directly from the mixer to carryalls eliminates all hazard of segregation due to chuting or hoisting, but it is not easy to fill carryalls properly from the mixer chute. The concrete leaves the mixer too rapidly, and strikes the carryall at too flat an angle, causing it to swirl and load the carryall unevenly. There is a tendency to load carryalls when they come to the mixer regardless of whether the batch has been mixed sufficiently, which is very detrimental to quality.

Distribution by Industrial Cars or Derricks

For mass work, the dumping of concrete directly from the mixer into derrick-handled buckets is most satisfactory. Buckets can be set so that the mixer discharge strikes the center of the bucket practically vertically. There is little vibration as the bucket is hoisted or lowered to the position where the concrete is to be deposited.

Concrete discharged directly from the mixer to industrial cars shows no unusual segregeation of aggregates, provided the discharged concrete drops vertically into the body. There is always less segregation in cars having deep bodies than shallow ones. For the best results, cars and buckets should be equipped with suitable dumping gates, through which the velocity of flow is controlled. The settling of heavy aggregates which may occur during transit is largerly counteracted by the fact that the finer aggregates from the top tend to flow more rapidly when the bottom gate is opened than the heavier closely packed aggregate near the bottom. The result is a very satisfactory remixing. With cars or buckets that dump over the top this process is reversed; the fine material which has risen during transit is discharged first over the top, leaving the hard-packed aggregates with no chance of remixing, as the fine materials flow much faster than the heavy aggregate if separated. The importance of bottom-dumping equipment cannot be over emphasized.

The track for industrial cars should be free from abrupt turns or irregularities which transmit jolting action to the concrete.

Distribution by Pneumatic Methods

On practically all tunnel work, placing concrete in the forms by means of pneumatic machines has been found most satisfactory and efficient.

In pneumatic placing the discharge end presents the greatest liability for segregation of the aggregates. If the discharge line is simply extended into the section of tunnel lining to be concreted, the force of the air sends the heavy aggregate to the opposite end of the form, while the fine materials fall in a sharper curve with disastrous results. The discharge pipe should be carried to within a few feet of the far end of the form and be properly baffled. As filling progresses, short lengths of the discharge pipe are removed, until only a small space at the near end of the form remains open. This space is left until the next fill is made, forming a key between the sections. From a quality standpoint, pneumatic placing has everything in its favor. Inspection of tunnels shows that air-placed concrete is much freer from honeycombing than hand-placed concrete. Leakage through concrete placed by air is also much less.

Effect of Admixtures

The use of admixtures is now steadily gaining favor with those familiar with placing concrete. Authorities agree that changes in the final strength of concrete containing suitable proportions of proper admixtures will not vary much more than the percentage of the admixture used.

The real value of admixtures does not lie in added strength given to the concrete, but in increased workability. This is especially true with the leaner mixes. The larger aggregates in concrete containing admixtures seem to be coated more completely with a covering of fine material which clings to the aggregates, decreasing their rolling action but increasing their sliding qualities. Rich stiff concrete ordinarily possesses enough workability so that no improvement for proper handling is required.

Hydrated lime has been added to concrete on various classes of work for years and no detrimental effects have been found. Celite is a comparatively new material, and its effects on such qualities of concrete as strength, absorption of moisture, weathering, etc., are still under observation.

For many purposes either material can be used as an admixture without question: for example, for increasing the workability of harsh mixtures where the aggregates cannot easily be varied; where complicated form work or reinforcing is encountered; where

concrete is to be placed on sloping forms; or where the workability of the concrete must be retained for a considerable time while some other portion of the forms is being filled. On other classes of work, such as exterior walls exposed to severe weather conditions, concrete designed to resist water pressure, or concrete requiring especial strength, probably either hydrated lime or additional portland cement would produce the best results.

Placing Concrete in the Forms

The quality of concrete can be damaged considerably by careless placing in the forms. One of the fundamentals of placing is that concrete falling through space tends to segregate. Another is that the surface of flowing concrete must be kept approximately level. If these two points are well guarded, and care used in working the concrete against the form, and between the reinforcement, well-placed concrete will be the result.

While the cleaning of forms may appear too commonplace for consideration, it is nevertheless a factor in the proper placing of concrete and needs emphasis. Form details affect the appearance and quality of concrete, also. No large cracks between boards or panels can exist without draining some of the richest material from the concrete.

Rapping of the forms gently is of considerable assistance in increasing the flow of concrete around reinforcement and into corners. Continued vibration is not necessary on ordinary work, but is a valuable feature which must not be overlooked on complicated form work.

No excess water should accumulate on the floor panels in front of a floor pour, but the material should be kept workable enough to fill the forms completely. The practice of wheeling over concrete poured one or two days previous should be discouraged, especially during cold weather.

Far too little attention is paid to necessary clearance between the steel and the forms on most operations, although it is well known that steel left too close to the surface will in a short time force very sizeable pieces of concrete from the face of the structure, greatly affecting the appearance and ultimately the strength. While placing concrete, this point should receive the constant attention of the entire concrete gang, as well as the whole attention of at least one man assigned for the special purpose of keeping all steel back from exterior surfaces.

W. N. Jennings Photo.

Passenger Station of the Pennsylvania at Wilkinsburg, Pa.

Canadian National Develops Safety Device for Motor Cars

W. A. Booth

Director, Safety and First Aid, Canadian National, Montreal, Que.

THE safety department of the Canadian National has developed a device to prevent hand cars or motor cars from leaving the track in case the wheels are derailed. The need of such a device is apparent from statistics which show that during 1926, 63 persons were killed and 4,471 were injured in the United States, due to the derailment of hand or motor cars, while on the Canadian National alone 4 deaths and 80 injuries resulted from this cause during the same period.

The device consists of four metal brackets bolted securely to the side sills at each corner of the car body, in such a way that the lower part of the bracket is located transversely to the rail, and clearing the top of rail by 2½ in. when the wheels are on the track. In case of a derailment the brackets drop on the rail and the car is restrained from leaving the track by 1-in. flanges which project downward from each end of the lower part of the bracket. In addition to keeping the car on the rails the friction between the brackets and the rails acts as a brake to stop the car.

Derailed Motor Car Held on the Rails by Safety Brackets

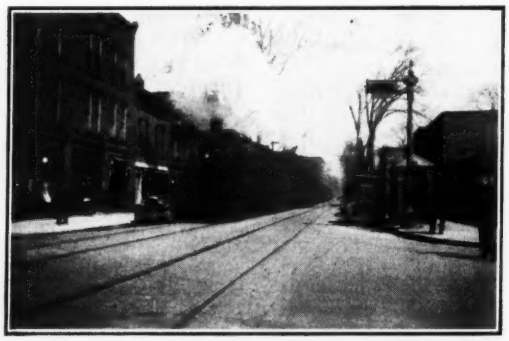
Extensive tests were made by the Canadian National to determine the efficiency of the device in derailments of motor cars at various speeds. In order to derail the wheels where the action of the brackets could be observed an oak wedge about five feet long and the depth of the rail was placed along the gage line of one rail, to act as a point derail while a metal wedge about 12 in. long, tapering to a thickness of about 1½ in., was fastened securely to the top of the other rail at a point opposite the center of the oak wedge to lift the flanges sufficiently to allow them to be forced over the top of the rail. During the tests motor cars equipped with these brackets were derailed at speeds varying from 10 to 30 miles an hour and the device was found to function satisfactorily. The brackets must be attached securely to the car and can also be braced from the bottom of the bracket to the side frame of the car.

Don't Be Too Sceptical.—There are times when it is wise to believe all you hear, for instance, when you hear a locomotive whistling for a grade crossing.

N.Y.C. Tries Welded Joints in Paved City Street

Results Obtained from Experiment in 1926 Lead to Further Installations for Test Purposes

AN INTERESTING experiment in the Thermit welding of rail joints in a paved city street was conducted by the New York Central during 1926, and owing to the apparently satisfactory results which have been obtained, a further installation of the welded joints is being made this year in the hope of obtaining better track conditions and longer rail life, with more economical maintenance. It is also hoped that a better surface can be maintained in the pavement in the vicinity of the track joints through this type of construction.



The Empire State Express Passing Through Washington Street, Syracuse

The experiment is being tried in Washington street, Syracuse, N. Y., where work was begun a few years ago on the reconstruction of the New York Central's two main passenger tracks, in connection with the resurfacing of the street pavement. All of the New York Central's heavy through-passenger traffic, which amounts to about 109 trains a day, moves over two tracks which are laid in this street, for a distance of about 1½ miles.

When the New York Central laid its tracks in Washington street originally, comparatively light rail was used, supported on Dugan four-inch cast iron rail chairs, but owing to the difficulty of maintaining good track with this construction as the traffic increased, this section of track was reconstructed in 1909. The construction carried out at that time was in the main similar to that in service at the present time. As shown in the accompanying cross-section of the tracks and pavement in Washington street, this type of construction consists of 141-lb. Bethlehem steel section 263, 9-in. girder rails in 33-ft. lengths, supported on steel tie plates and screw-spiked to 7-in. by 9-in. by 8½-ft. yellow pine ties, which in turn are supported on stone ballast. The pavement in Washington street is of Medina sandstone blocks resting on a sand cushion, with 3 in. of concrete between and level with the tops of the ties. The rail joints which have been used throughout this piece of track have consisted of 12-bolt continuous bars, 36 in. in length.

This construction stood up quite satisfactorily for a time, but with the growth of traffic in recent years considerable difficulty has been experienced from battered rail ends and low joints, and trouble has been encountered in keeping the tracks in good surface, it being impossible to resurface the tracks without removing the street pavement. Under these conditions it became necessary to reconstruct the tracks in 1919, at which time the same type of construction was used. But after only seven years of service, it again became necessary to reconstruct the tracks in part during 1926, owing to the fact that the rails at the joints had become badly battered, making a noisy and rather rough track, and because the pavement in the vicinity of the rail joints was in poor condition. A study of this condition showed that the life of the rails in this location was governed by the life of the rail ends, and that the pavement in the immediate vicinity of the joints also showed the first indications of deterioration and failure. In view of this situation, the New York Central, when reconstructing the tracks in 1926, decided to try out a small number of Thermit rail welds in order to determine whether this type of rail joint construction would stand up under heavy steam railway traffic, and possessed all of the merits claimed for it, especially that of non-cupping. While the work done at that time included the welding of only 51 joints, it was felt that such an installation would give a fairly accurate indication of what could be expected from such type of construction under heavy traffic within a relatively short time.

The Process of Thermit Welding

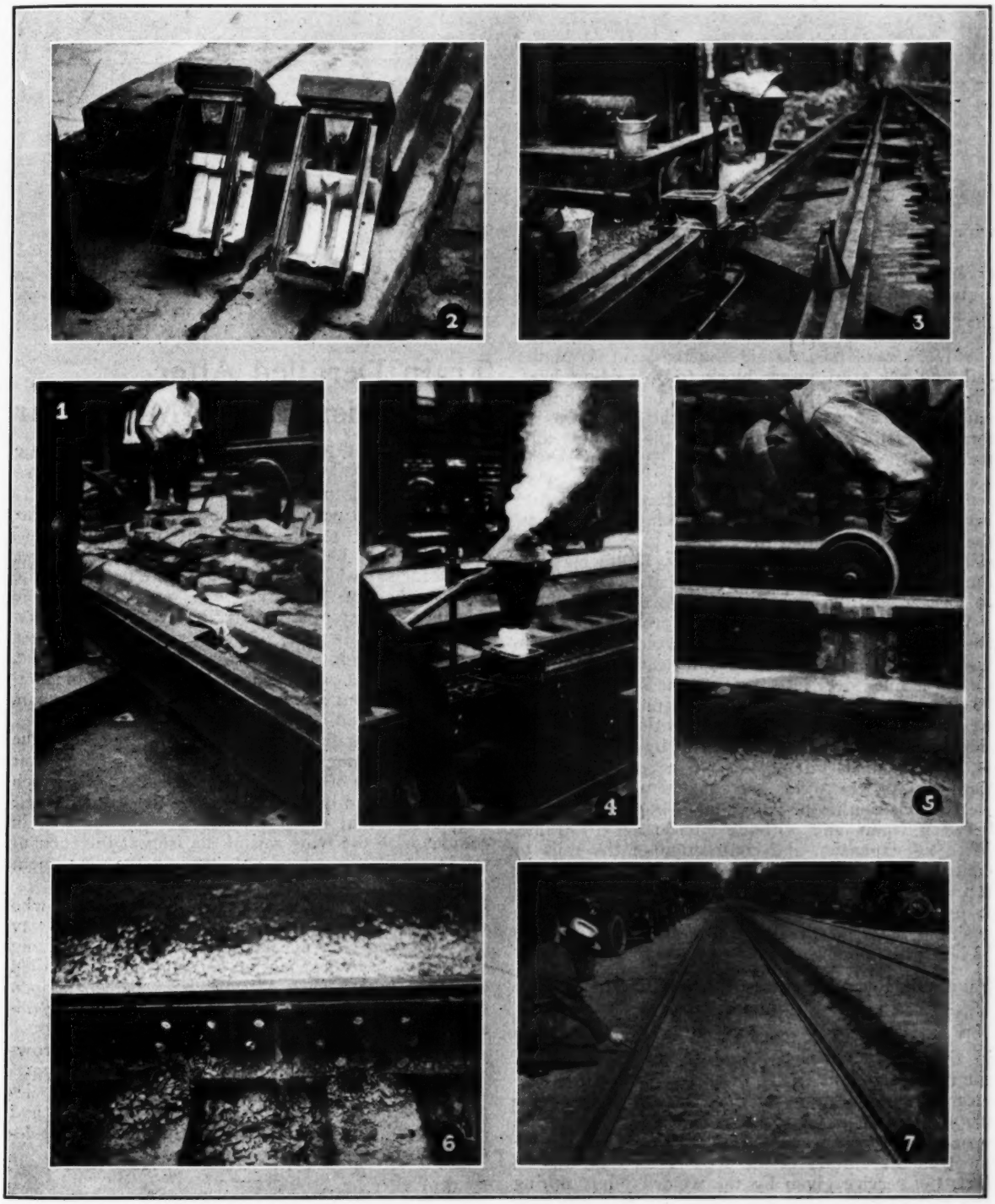
While the Thermit welding process in joining rail ends is not new, having been used by street railways for about 15 years, its application to steam railroad tracks in paved streets is of comparatively recent date. Briefly, in Thermit welding, the rail is made continuous, thus eliminating entirely the hammer blow of joints which otherwise develops even with rail laid tight, and also eliminating the disintegration of street paving around joints. The continuity of the rails in such construction also results in smooth riding track and is sufficiently strong so that it does not require additional supporting ties.

In Washington street, where it was necessary for the work to proceed without interrupting rail traffic, several lengths of the new rails, which were of the same section and weight as the old rails, were lined up on ties along one side of the street, which was closed to traffic temporarily while the paving work was going on. With both lines of rails thus supported and placed parallel to and in the same relative positions that they were to occupy in the track, the adjacent rails were carefully leveled and lined, with a space of ½ in. between rail ends, ready to be welded. In the space between the rail ends, flush with the top and gage side of the rails, there was placed a small rectangular steel insert ½ in. thick, which was similar in composition to the steel in the rails.

As the welding metal which is used to join the rails is of softer steel than the rail steel, the function of the insert between the rail ends is primarily to give a hard wearing surface of metal in the final

joint weld, which is homogeneous with the metal making up the rails themselves.

With the rails in this position, special sand molds, corresponding to the rail section and parted vertically through the center of the web, were applied and fastened in proper position on each side of the rails at the joints by means of a special clamp arrangement. In this position the molds fitted tightly against the rails, leaving just sufficient space between them for the welding metal. The preheating of the rails, which was the next step in the welding operation, was accomplished by means of a specially designed preheater, using kerosene oil and compressed air. The flame from this preheater, which is in the form



Views of the Thermit Welding of Rail Joints in Washington Street

(1) Lined and leveled with insert block installed ready for welding. (2) The two-part sand molds. (3) Preheating of the rails under way. (4) Reacting the Thermit metal. (5) Grinding the surface of the weld. (6) A completed Thermit weld in the track. (7) In some instances it is difficult to locate the welded joints

of a torch, was admitted through a heat gate in the lower portion of one of the molds, drying out the green sand in the molds and subsequently heating the rail ends to a cherry red, preparatory to making the weld.

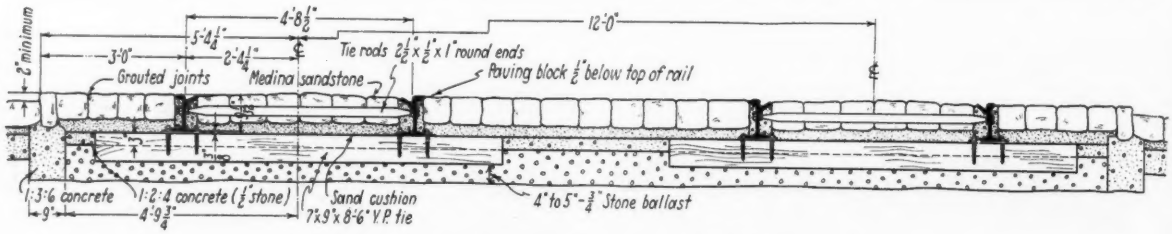
At the completion of the preheating operation, which required an average of about 25 min., the Thermit reaction was carried out in a conical-shaped crucible supported over the mold, into which the high temperature Thermit steel was tapped. Upon entering the mold, the Thermit steel, by virtue of its temperature of approximately 5,000 deg. F., fused about the rail ends, raising the temperature of the rail and the steel insert block to a welding heat. Thus with the insert firmly pressed between the rail ends by reason of the expansion the effect was to form at least a partial butt weld of the homogeneous metal in the rails and filler block. As soon as the weld began to cool and take shape, the molds were removed from about the joint, and when the weld had cooled still further and was taking its final set, the surplus metal about the top and gage side of the rail heads was removed by a chisel. Following this, the top and gage side of the rail heads were ground to form a continuous and uniform wearing surface.

When from 8 to 10 such joints were completed on the Washington street work, the old rails in the track were lined out and the unit section of welded rails was lined over into position and spiked. While 10 rails was about the maximum number of rails welded into one unit and lined into the track at one time, this was governed primarily by the necessity of keeping open intersecting street crossings. At these points, the welds were made while the rails were in position in the track, this being accomplished between trains and without interference to traffic. With no expansion and contraction of the rails to contend with, owing to the fact that all but the top of the rail heads was embedded in the pavement, each line of rails was therefore welded into a single unit, except at frogs and crossings where 12-bolt rail joints were used.

Favorable Results Lead to Further Use of Welded Joints

In spite of the fact that only 51 joints were welded in this particular piece of work during 1926 and the relatively short length of time in which this construction has been in service, the behavior of the installation under the severe traffic conditions imposed has been such as to afford much encouragement to the officers of the New York Central. In fact, the service given by the welded joints during the past year has been so satisfactory that the New York Central has felt warranted in making a further installation of this type of joint. During the present year, therefore, it contemplates the installation of approximately 100 additional Thermit welded joints in Washington street, Syracuse, when the track reconstruction work is continued at this point.

All of the joint welding at Syracuse was done by the Metal & Thermit Corporation, New York, while all of the regular track work was done by company forces. We are indebted for the information contained in this article to P. H. Winchester, division engineer of the New York Central at Syracuse, under whose direction the reconstruction of the tracks in Washington street has been carried out.



Cross Section of the Pavement and Tracks in Washington Street

Train Derailed After Collision with Motor Car

ON APRIL 29, 1927, a freight train on the New York, Chicago & St. Louis collided with a track motor car near Westfield, N. Y. The employees who were riding on the motor car, a car repairman and a laborer in the car department, cleared the car before the collision occurred, and as the motor car was thrown clear of the track and the engineman saw that no one was injured, he refrained from stopping the train, which continued on its way for a distance of about one-half mile to a switch leading into a spur, where it was derailed. This derailment resulted in a large amount of damage to equipment and in the death of the engineman, fireman and head brakeman.

In an investigation by the Bureau of Safety of the Interstate Commerce Commission, it was found that some wreckage of the motor car or some tools which had been loaded on the car became lodged under the engine and that when this debris was brought in contact with the wing rail of the frog at the turnout the lead rails were torn out, causing the derailment of the train.

It was also developed that the car repairman, who was returning to headquarters on the car, had no way of obtaining information concerning approaching trains and that he had in consequence felt called upon to "take a chance" until he reached an open office. The report concludes with the following observation:

"It has been pointed out previously that the growing use of gasoline motor cars in the various departments of a railroad is introducing an additional element of danger to the safe operation of trains, and steps should be taken toward providing more adequate protection for their movements."

FIFTY YEARS AGO.—Conductors on the Lehigh Valley have received orders from the train dispatchers to put away their own passenger trains, and also to make them up. This work has heretofore been done by the baggage masters.—*Railway Age*, April 19, 1877.

Concrete Ties on the Streets Run Bridge, Monongahela Division—In the Insert, a Phantom View Showing the Reinforcement

Pennsylvania Starts Extensive Tests of Concrete Ties

Is Now Installing Several Thousand Substitute Ties in Main Tracks on the Eastern and Central Regions

TWENTY-FIVE years of sporadic endeavor to develop a concrete substitute for the wooden cross tie have been attended with indifferent success. Whether this has been due to improper design, poor workmanship, excessive cost or lack of interest on the part of railway officers need not be discussed here. The installation of the various designs of ties have been made with a relatively small number of ties, usually in unimportant tracks, and have received little attention. In fact, if it had not been for the efforts of the sub-committee on substitute ties of the American Railway Engineering Association, little or no record would be available today of the varied designs that have been tried at different times during the first quarter of the present century.

In view of this, it is of particular interest that the Pennsylvania Railroad is now installing several thousand reinforced concrete ties in the Eastern and Central regions for the purpose of conducting what is without question the first conscientious attempt made by any American railway to determine the possibilities of concrete for this purpose. Preliminary installations of ties of the same general design as those now being delivered to the railroad were made on the Streets Run bridge near Pittsburgh, Pa., and at Aspinwall. Both of these installations are in main tracks of the Pittsburgh and Conemaugh divisions of the Pennsylvania and were placed in October and November, 1925, respectively.

Present plans call for the use of these ties in about three miles of main line freight tracks between Pittsburgh and Philadelphia, while a number will be used in main tracks of branch lines. The ties are being manufactured for the Concrete Tie Company, Pittsburgh, Pa., and furnished to the railroad company on contract.

The tie which is now being installed does not differ greatly as to size and shape from the standard wooden tie. It is 8 ft. long, 10 in. wide and 8 in. high, except that the ends are raised for a length of about 11 in. to provide a shoulder to receive the thrust of creosoted oak blocks 14 in. long, 5 in. wide and 1¾ in. thick which serve as rail seats. Two octagonal holes pass through the tie at the rail seat to receive 3-in. creosoted oak spiking plugs.

No change in the customary rail fastening is involved in the design, except that longer spikes are used to make up for the thickness of wooden tie blocks and to provide sufficient penetration into the spiking plugs. The tie plate differs from those used on wooden ties in that it is shortened somewhat in length and the edges are rolled down so as to compress the wooden tie blocks. This makes up to a certain extent for the reduced bearing area under the rail as compared with the full width of a wooden tie. These tie plates weigh 11½ lb. each and the steel reinforcement for one tie weighs about 57 lb.

The Design

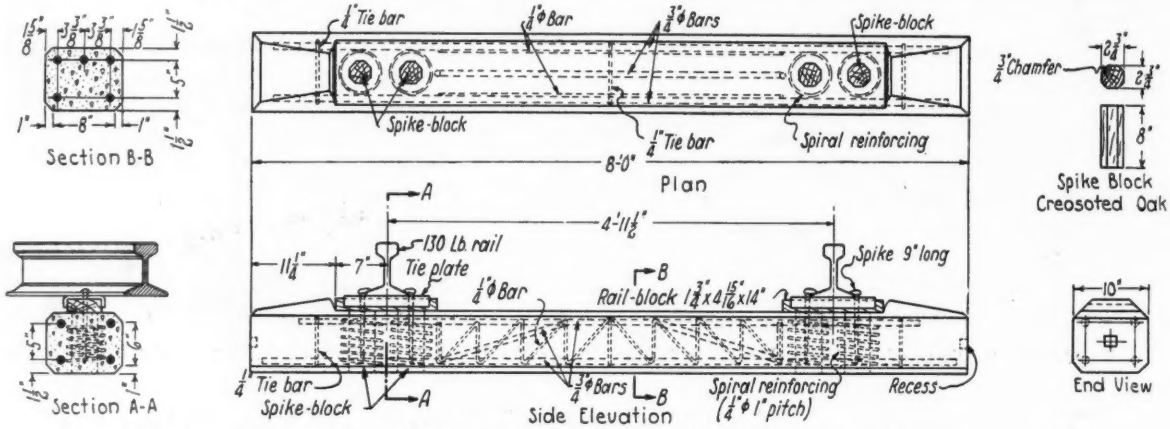
The tie is designed to carry a locomotive wheel load of 127,200 lb. (including the impact allowance). This load is assumed to be distributed over three ties, making a total load of 42,400 lb. for each tie. The roadbed reaction is assumed as uniformly distributed over the entire length of the tie, amounting to 5,300 lb. per lin. ft. of tie. These assumptions as to load-

ing produce theoretical stresses of approximately 1,100 lb. per sq. in. compression in the concrete, 17,000 lb. per sq. in. in the tensile steel and about 7,000 lb. per sq. in. in the compression steel. The unit shearing stress in the concrete under the rail is approximately 250 lb. per sq. in. The assumed loading is approximately equal to that produced by a Cooper E-60 locomotive with an allowance of 100 per cent for impact.

In addition to the longitudinal and web reinforcement, the ties are provided with spirals with an inside diameter of 5¼ in. made of ¼-in. diameter rods on a 1-in. pitch which are installed around each spiking plug to increase the spike-holding power and to resist bursting pressure occasioned by driving the spike plug or swelling of the plug with the absorption of moisture.

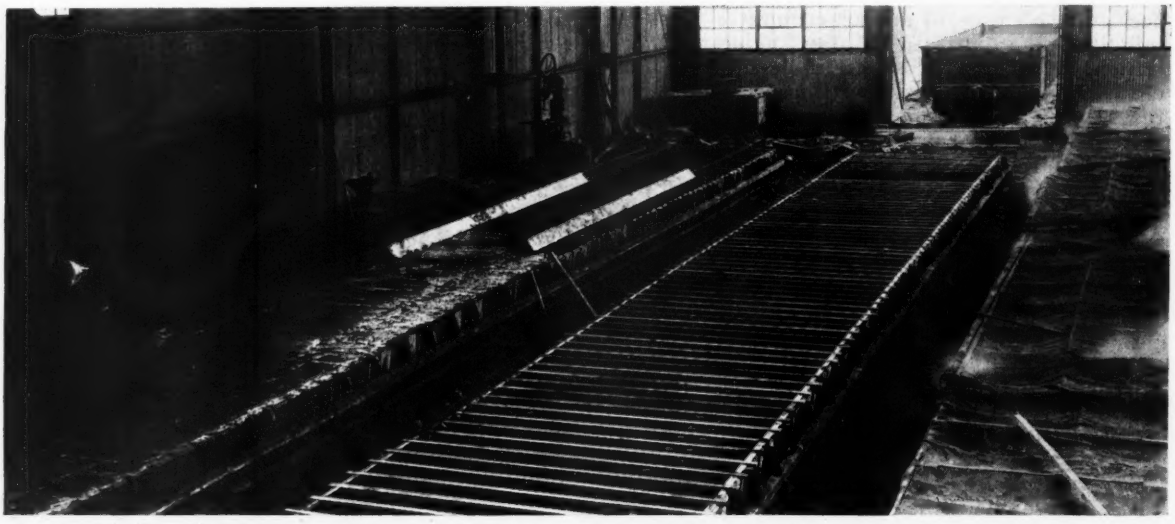
The design of the ties used on the Streets Run bridge and at Aspinwall is somewhat different from that of the ties now being manufactured. The diagonal or shear reinforcement connecting the top and bottom longitudinal bars was not present in the first design. The central bar was also absent and some cracks opened up in the first installation due to center binding. Tests on the design now used were made as a result of the experience on the first installation which show that the present ties will carry a load applied at the center of the tie when simply supported upside down along the line of the rail bearing to the amount of 32,800 lb. This corresponds with the load capacity of 20,000 lb. for the ties that did not have the shear reinforcement or the extra bar in the top.

The ties are being manufactured by the John F. Casey Company, contractors, Pittsburgh, Pa., at a plant in Aspinwall. The molds for the ties are of the gang type and each gang consists of approximately 100 molds. The bottom of the molds consists of a plank platform raised about two feet from the earth floor of the building. The side forms or dividing plates are of steel and the end forms consist of wooden blocks. The ties are cast bottom side up. While the concrete is being placed the assembled "cages" of reinforcement are jiggled and the concrete worked into the molds by hand so as to secure thorough embedment of the bars.



Details of the Reinforced Concrete Tie

Finishing is done with a handled wooden float immediately after which the entire gang of filled forms is covered with tarpaulins carried on a framework. The sides of the tarpaulin hang down to the floor enclosing the entire set of molds and steam is turned into the space under the tarpaulins through perforated steam pipes laid along the ground at each side of the platform. This "steam curing" is carried



Making the Ties. One Rack of Forms Partly Poured, One Rack With the Reinforcement in Place and One Rack Being Cured by Steam

on for 24 hours, after which the ties are exposed to the air of the plant for another 24 hours and then handled in groups by a five-ton overhead crane to cars for shipment. Thus the ties are shipped out of the plant 48 hours after casting.

The mix was worked out to produce concrete of 2,500 lb. per sq. in. at 28 days with approximately a four-inch slump and consists of one part cement, 1.8 parts sand and 2.4 parts gravel. The aggregate is obtained from the Allegheny river. Test cylinders show that at 48 hours after curing the concrete has attained a compressive strength from 900 to 1,100 lb. per sq. in.

Details of Manufacture

The mixer is a batch type of ½ cu. yd. capacity. The water is regulated by means of a tank equipped with a gage and a graduated scale, by means of which the amount of water used for each batch is easily controlled. The aggregate is supplied to the mixer from overhead bins and is measured in mechanical batchers.

The concrete is handled from the mixer by means of a five-ton overhead crane. The mixer dumps directly into truncated cone-shaped buckets that are handled by the crane to proper place over the gang molds. In fact, all of the heavy work in the plant is done by this overhead crane.

Not only are all of the bars bent in the assembly room, but the wooden plugs are manufactured there also. The lumber for these plugs consists of three-inch oak planks which are first ripped into blocks 3 in. square and then passed through a four-side sticker, thus producing pieces roughly octagonal. These pieces are then cut by a power saw to the required size and, after drying in a rack over a coke salamander, are dipped in creosote.

The capacity of the plant including the assembling of the reinforcement, manufacture of plugs, placing of concrete and removal of the completed ties, is about 150 ties per day. The plant is operated by about 30 men.

The work of manufacturing the ties was in progress during the past winter and, in order to make it possible to ship ties in 48 hours, the water was heated to about 150 deg. F. and the aggregate also heated by means of steam coils in the overhead bins. The concrete was placed at a temperature of about 70 deg. F. and as soon as covered with tarpaulins the temperature was raised by means of live steam to about 90 deg. After each use the forms are cleaned by brushing and scraping and oiled with Corvus form oil.

Installation and Handling

Since these ties weigh approximately 600 lb., mechanical equipment for unloading and handling them is desirable. Unloading has been efficiently done with an ordinary air-hoist rail unloader. It is expected that similar equipment will be used to distribute the ties and that installation in face will be handled by power equipment. However, the tie is of such weight that it can be handled by five or six men.

The economic advantage of these ties as compared with wooden ties cannot be definitely determined at the present time. The installation on the Streets Run bridge has indicated that the track holds its line and surface on the concrete tie section much better than it does on the wooden tie tracks adjoining. This is probably due to more bearing on the ballast afforded by the concrete tie and to its greater weight. Estimates based on reasonable assumptions as to service life and cost in place indicate that at the present there is little difference in annual cost. Such estimates do not, however, give effect to better track condition and reduced track labor. It may be that these factors will make the concrete tie decidedly more economical than the creosoted wooden ties

Much of the data for this article was furnished by the Concrete Tie Company of Pittsburgh. A. C. Shand, formerly chief engineer and now assistant to the vice-president of the Pennsylvania, was largely responsible for the decision to install these ties in tracks of that road.

Severe Storm Causes Washout on the M-K-T

A PASSENGER train running between Parsons, Kan., and Kansas City, over the Nevada division of the Missouri-Kansas-Texas, was derailed by a washout at the Flat Rock Creek bridge about 3½ miles north of St. Paul, Kan., early on the morning of April 8, according to a report issued by the Bureau of Safety of the Interstate Commerce Commission. The train in question was being detoured over the Nevada division at the time because of another washout that had occurred some hours earlier on the main line between Parsons and Kansas City.

Both of these washouts were the result of extremely heavy rainfall during the night of April 7-8. Records of the United States Weather Bureau at points in the vicinity of St. Paul showed a total precipitation between 9 p. m. and 6 a. m. ranging from 5½ in. to more than 8 in. This heavy rainfall, however, did not seem to cause any concern on the part of railway employees responsible for the safe operation of this train which was traveling at a speed estimated at between 40 and 50 miles per hour at the time of the derailment, notwithstanding the fact that it was being moved over a detour route. Furthermore, neither the dispatcher nor the operator stationed at Walnut, the nearest open station to St. Paul, had considered the storm of sufficient severity to issue slow orders or call out section gangs to patrol tracks.

The section foreman in charge of the section on which the derailment occurred testified that he had slept throughout the entire night without being aware that any storm was in progress although he said that it was raining gently when he went to bed about 8:30. The foreman of an adjoining section, also living at St. Paul, said that he had been awakened during the night by the storm but had not considered that it was of sufficient severity to require him to get out and patrol the track.

Notwithstanding the statements by the railway employees, residents of the vicinity said that the storm was of unusual severity and was accompanied by severe thunder and lightning. The conclusion of the Bureau of Safety is that "It is inconceivable that the existence of a storm of such severity should fail to cause any one connected with the railroad to realize that precautions should be taken to safeguard the movement of trains, yet apparently this was the case in this instance." The report, however, does not place responsibility for the accident upon any particular employees.

What's the Answer?

What Our Readers Have to Say on Current Questions That Perplex Those Engaged in Maintaining Tracks, Structures and Water Supply Facilities

QUESTIONS TO BE ANSWERED IN THE OCTOBER ISSUE

1. *What measures can be taken to insure that operators of motor cars receive accurate "line-ups" of trains from telegraph operators?*
2. *What are the relative merits of metal and wooden sash for railway buildings, with special reference to enginehouses?*
3. *How can the replacement of broken rails of heavy sections (say 130-lb.) be accomplished by a small section gang?*
4. *Under what conditions is it advisable to install headwalls at pipe culverts and what are the advantages?*
5. *What are the relative merits of metal and wooden handles for track shovels?*
6. *What should be the relation between the size of a water column and the size of the pipe supplying it?*
7. *When making a high lift on main track in hot weather, what special precautions should be taken?*
8. *What are the relative merits of stationary and revolving ventilators for various types of railway buildings?*

Overcoming the Settling of Embankments Next to Abutments

What is the best way to overcome the settling of the embankment next to the abutments or bulk-heads of bridges?

The Filling Material Should be Carefully Selected

By A. Montzheimer
Chief Engineer, Elgin, Joliet & Eastern, Joliet, Ill.

In filling back of abutments of bridges special consideration should be given to the material used for filling. What is desired is a material that will produce the least settlement and at the same time will not subject the abutment to excessive pressure. On this account the lighter materials, such as cinders, sand, ashes or granulated cinders from blast furnaces, are recommended. Fills of sand or granulated cinders are to be preferred on account of the danger of fire where fills of more than six feet are made with locomotive ashes. Coarse gravel is objectionable for filling on account of excessive settlement, extending, in some cases, over a period of years. We had a large fill made of coarse gravel, some of the stones being six or eight inches in diameter, and the settlement of this fill extended over a period of fully 10 years.

About 30 years ago a drawbridge was built on a very soft foundation, it being necessary to drive piles about 80 ft. long. The piles were cut off about 18 ft. below the top of the water and the masonry abutment constructed. In filling back of this bridge large round stones that had accumulated in a gravel pit were used. These settled into the soft filling back of the piles and pushed the abutment out into the river so that it was necessary to move the back wall of the abutment some two feet in order to close the drawbridge. This illustrates the danger of filling back of an abutment with heavy material. Ordinary earth filling is generally used back of abutments and if facilities are not available for puddling this material excessive settlement will be encountered. On this account sand or granulated cinders are much to be preferred for filling.

The Embankment Should Be Made of Material Which Drains Well and Has Little Shrinkage

By Division Engineer

The troubles of the trackman and the cost of maintenance due to the settlement of the embankment next to the abutments of bridges are well known and justify special precautions in selecting and placing the filling material at such locations. The maintenance man has no choice in the case of a newly constructed line since he must take the finished work as it is turned over to him by the construction department. In the case of new permanent bridges or the filling of trestle approaches to existing bridges, however, he is in a better position and should endeavor to make the fill next to the abutment of material which will obviate these troubles to the greatest possible extent.

Settlement of the embankment next to abutments is due to two causes; the shrinkage and compacting of the material under traffic and improper drainage and of these the last named is the most important,

for if the material is such that water will drain through it, it is only necessary to raise the track at intervals until the settlement of the material has ceased. Where the material will not drain, water pockets often form next to the abutments, which, if not drained, will cause soft track for years.

Sand or fine gravel are usually the best materials that can be obtained for filling next to bridge abutments since they do not settle excessively after being placed and drain excellently. Granulated slag is another material having the desired properties but it is available at comparatively few places. Well burned engine cinders are also good but will settle to a greater extent than the other materials mentioned. If it is necessary to use a material which will not drain well, drain pipes should be installed behind the abutment as the fill is made, laying them to such grades that the settlement of the fill will not interfere with their functioning.

Compromise Joints at Turnouts and Crossings

Where a turnout or crossing is of a different section of rail from that of the track should compromise joints be used at the frogs or a rail length away?

Compromise Joints Should Never Be Used at the Heel of the Frog

By G. J. Slibeck
Chief Engineer, Pettibone-Mulliken Company, Chicago

In the case of ordinary turnouts, compromise joints should never be used at the heel joints of frogs because at this location the turnout ties also extend under the turnout rail and the putting of a compromise joint at this point would necessitate adzing the ties if the rail is of a higher section than the frog, or of shimming up the rail if it is of a lower section. The proper location of the compromise joint is beyond the point where the turnout ties end. Many track supervisors place the compromise joints on parallel tracks at the point of full clearance.

Where a crossing is concerned there are two or three factors which control the location of the compromise joint. The type of construction of the crossing is one of these factors and whether the track is bonded for interlocking or signaling is another. The signal engineer wants the insulated joint as near the crossing as possible and as a compromise joint cannot be insulated very well he prefers to have the compromise joint at the crossing. I prefer new rails of the same section of the crossing, with stiff joints next to the crossing and with the compromise joints further back.

The Compromise Joints Should Be at Least One Rail Length from the Frog

By W. F. Rench

I believe that all maintenance men agree that compromise joints, if any are required, should be located at least one rail length from the turnout or crossing frog, except, of course, where a crossing is of the girder type and the compromise is effected through the design of the manganese arms. The reasons for the separation of compromise joints from the turnout frog or crossing structure may be worthy of some comment, particularly in view of the greater attention now being given to concrete slabs and other foundations for crossings.

The crossing foundation, whether a special tie layout, framed timbers or concrete slabs, extends beyond the limits of the crossing frogs, and the switch ties seldom end just at the heel of frog. The practical difficulty of effecting a suitable compromise on the timbers, and the greater stresses imposed on the crossing slabs by the presence of compromise joints, make it desirable if not essential that these be removed to a distance from the structure.

Drainage is now recognized as a prime consideration at both turnouts and crossings. It is well known that compromise joints tend to produce pumping, which is destructive of all drainage advantages. Increased service life of frogs or crossings demands, therefore, that these structures be relieved of any unnecessary impacts of the traffic, by locating the compromise joints one or two rail lengths from the structure.

Protecting Earth Dams from Burrowing Animals

What is the best method of protecting earth embankments of reservoirs from muskrats or other burrowing animals?

Core-Walls or Paved Slopes Are Effective

By C. R. Knowles
Superintendent Water Service, Illinois Central, Chicago

There are at least a dozen different animals that are liable to injure earth embankments of reservoirs by burrowing, among which are porcupines, badgers, foxes, skunks, beavers, woodchucks, muskrats, moles, rats, mice and rabbits. These last five animals offer the most serious problem in this country as the first mentioned are becoming more rare and therefore there is less danger from their burrowing.

The muskrat is undoubtedly the most dangerous animal to be considered in this connection as it has given more trouble than any other in embankments. Crawfish, turtles, snakes, eels and worms are also liable to cause trouble with earth embankments.

Various methods are followed in protecting earth embankments against the inroads of these animals. Perhaps the most effective is the construction of these embankments with firmly-packed, hard-rolled homogeneous material. This is not possible in every case, however, as the proper material is not always available and it adds considerably to the expense. Paving the upstream slope or both slopes with concrete is also an excellent method of preventing animals from burrowing into the bank. This, while effective, is a very expensive form of protection.

Core-walls are also effective when constructed of concrete or timber. Where the core-wall is constructed of wooden sheet piling the timber should be creosoted, as in addition to adding to the life of the timber the creosote oil is repellent to most animals. A puddled core-wall is useful if constructed of the proper material. A puddle wall should be composed of 75 to 80 per cent of gravel as the gravel offers more resistance to the animals than clay or earth. One of the simplest and least expensive methods of protecting the embankment is sodding the downstream slopes, and while it is not as effective as paving the slopes or constructing a core-wall it offers resistance to burrowing animals in most parts of the country. If the possibility of damage from burrowing animals is very great the embankment should be provided with a core-wall extending from

below the foundation line to a point above the water line. Paving the upstream slope and sodding the downstream slope of the embankment offer as good protection from animals as a core-wall and while more expensive have the added advantage that the paving on the upstream slope and sodding on the downstream slope prevent damage from wave-wash on the upstream side and erosion on the downstream side.

A Layer of Sand or Small Gravel on the Slope Is Cheap and Effective

By E. M. Grime
Engineer of Water Service, Northern Pacific, St. Paul, Minn.

Burrowing animals are discouraged by a soil condition such that when a hole is bored into the embankment caving takes place. This soon closes up the entrance, cutting off both air and light.

It is usually impracticable or too costly to pave the embankment with such a close layer of riprap stone that there will be no spaces where these animals cannot get through and the best protection is afforded by spreading and maintaining over the entire slope a layer of small sized gravel and sand to a depth of 10 or 12 in.

"Hard Riding" Frogs

What is the cause of frogs riding "hard?" What can be done to eliminate this condition?

Special Attention Must Be Given to Alinement, Gage and the Prevention of Creeping

By J. B. Martin
General Inspector of Track, New York Central, Lines West, Cleveland, Ohio

Assuming that the frog is not worn and is in good surface, the principal reason for hard riding is faulty alinement through the turnout and frog. This may be due to incorrect gage, particularly through the guard rail, to crowding by equipment going through the turnout side or to rail creeping.

In order to maintain good riding frogs, just as much attention must be given to alinement as to surface, and this can be done by maintaining correct gage, using turnouts strong enough to withstand the shock of equipment going through the turnout side and anchoring sufficiently to prevent all rail creeping.

The Design, Installation and Maintenance of Turnouts Are Important Factors

By C. W. Baldridge
Assistant Engineer, Atchison, Topeka & Santa Fe, Chicago

If the hard riding or rough riding of trains, while passing over a frog, was due entirely to the fact that it is a frog that is being passed over, a train should ride just as roughly over every frog, and every car of the same kind should ride equally rough when passing over the same kind of a frog on any railway. It is a well known fact that cars ride "harder" over frogs on some railways than on others, and over some frogs than over others of the same kind on the same railway.

A rigid frog rides "hard" owing to the open flangeway which each wheel must cross and which cannot be bridged completely by the tread of the wheel. Where spring rail frogs are used, the main track movement over the frog should not cause any roughness or hard riding conditions if the turnout has been correctly designed and built and, of course, properly maintained. The spring rail frog closes the gap of the diverging flangeway, and makes a continuous rail for the main line movement, which should eliminate roughness if kept in good alinement. The turnout movement over a frog naturally rides harder and rougher than the straight line movement because it is a curved track movement and the wheels must pass over the open flangeway of the frog.

Spring rail frogs should be used in all turnouts from main track or from any track where fast movements of trains take place. Even at places where the divergent traffic movements through the turnout are equal, or nearly equal, to the straight line movements over it, they might well be equipped with spring rail frogs, for the fact that the frog must cause rough riding on one track is not a good reason for making both tracks ride rough.

The cause of "hard" riding of frogs should be looked for among a number of factors, some of which are as follows:

Correct design and construction of the frog.
Correct length of lead in the turnout.
Correct design of the alinement of the turnout.
Correct staking out of the turnout.
Correct construction of the turnout as staked, which includes correct alinement of the track, the frog and the turnout rails.
The correct length and proper setting of the guard rails.
The elimination of track-deforming appliances, such as switch heel filler blocks, which bolt through the main track rails, thus transmitting the creep of main track rails to the wing rail of the frog.

After these factors are properly attended to, the rest is a matter of maintenance.

The correct design of a frog means that the rails which form the wings and point of the frog should be made long enough so that standard joint bars can be used at both the toe and heel joints without fouling each other, and without shearing or special shaping of the joint bars. The frog should have the proper tread grooves planed in the wing rails and all parts should be carefully designed and made so that they can be kept in good order.

That the correct length of lead of a turnout is a subject of disagreement is evidenced by the fact that some railways use a lead several feet longer than others for a turnout with the same frog angle. With a given frog angle and the same gage of track the mathematical length of the lead must be the same, but what is the correct length of constructed lead? The railway whose turnout plans have correctly solved this problem has eliminated one of the causes of hard riding frogs.

A simple curve starting a given number of feet ahead of the end of the switch points, and so laid as to pass the gage line of the frog side rail of the turnout exactly through the theoretical point of the frog, used to be considered the correct alinement for a turnout and many turnouts have been staked in that manner. Later practice, however, has taken into consideration the fact that the frog is usually two intersecting straight rails, thus introducing a short tangent between the point and the toe of the frog, and also that the switch point is usually straight. Therefore, the proper turnout curve is one having a central angle equal to the angle of intersection of the switch point and the frog rail and which will be tangent to these members at the heel of switch and the toe of frog. These factors call for accurate design of the turnout, with careful staking out of each turnout, and equally careful construction and lining of the turnout as staked.

Hard riding over frogs is usually experienced on fast moving trains passing along the straight main track; hence it would seem that all that is necessary is to keep that side of the frog in line. Therefore, the question is likely to arise as to what effect the careful refine-

ments of design and construction of the turnout have to do with the main track side of the frog. They have nothing to do with it for the first few days, perhaps, and for a short time the straight side of the frog generally rides all right, but if the turnout is not carefully made the stresses set up by the trains which must take the turnout movement are potent factors in putting the straight line side of the frog out of line.

The correct length of the "stock," the distance of the bend in the turnout rail ahead of the switch point, like the length of the turnout lead, is an unsettled question. On some roads this distance is twice as great as it is for the turnouts on other roads. The most important feature of the length of stock is thus shown to be the fact that it can be varied to a considerable extent with no particular effect and, if properly arranged, with no danger to trains or track.

The most frequent cause of derangement of frogs with consequent "hard" or rough riding is the use of switch heel filler blocks which are bolted through the switch point and the running rails. These filler blocks are properly spreader blocks for the purpose of holding the heel of the switch point the proper distance from the main track rail and of giving to the switch point the support of the spikes along the outside of the main track rail.

These filler blocks are bolted to the main track rails with the idea of keeping the main track rails from creeping past the switch points, thus destroying the effect of the bend in the stock rail which turns out to make the switch opening. Properly anchored rail will not creep more than an inch or two and the shortening of the "stock" of the turnout by two or three inches is a matter of little consequence unless the "stock" was originally made shorter than it should have been, but the creeping of the main track rails for half an inch, when bolted fast to the turnout rails, is enough to keep the spring rail of a frog from closing properly and a creep of an inch under such conditions will put the frog into a twist which is bound to cause rough riding, and which is sometimes dangerous to trains.

Main track rails should be well anchored and the bolting of the heel filler blocks to the main track rails should be abolished, as the creeping of the main track rails will not be sufficient to be detrimental at the switch points and its damaging effect on the frog will thus be eliminated. Other factors in the hard riding of frogs are short guard rails and improperly spaced guard rails. Short guard rails are detrimental to good riding track because they do not begin their guiding of the wheels soon enough.

Any four wheel truck which has been repaired by having new arch bars installed upon one side only will be out of square if the arch bars so installed are either longer or shorter than the arch bars on the other side of the truck. A truck will also be out of square if the arch bars on one side bend or sag more than the bars on the opposite side. A truck out of square means that it will run to one side of the track and may exert great pressure against the rail on that side. When the leading wheel of such a truck bears against the spring rail of a frog, it at once begins to push the frog rail open and with a short guard rail in use, the pair of wheels will have run so far toward the opening frog wing that a severe jerk will result when the effective part of the guard rail is reached. Because of trucks which are out of square or which for any reason tend to run to one side of the track, all spring rail frogs should be protected by guard rails long enough to reach from a point opposite the toe of the wing rail to a point sufficiently back of the frog point to encounter the full width of rail head. Such a guard rail will catch the erratic pair of wheels before it has gained any side movement and will hold it until a rigid rail on the side opposite the guard rail is available again to guide the skewed truck.

Another factor to be considered is the width of flangeway between the running rail and the guard rail. The standard width of flangeway is designed for use with track of correct gage. If the gage at the frog is wide and the guard rail flangeway is of the standard width, it will tend to pull the wheels out of line and away from the frog. While if the gage is narrow, the standard width of flangeway allows the wheels to run too close to the frog point with consequent rough riding.

Distance Between Center Stakes on Tangents

In setting stakes for the relining of main tracks, what should be the maximum distance between the stakes on tangents?

Maximum Distance Should Be From 150 to 175 Ft.

By Division Engineer

In setting center stakes for relining main tracks the distance between the stakes on tangents should be from 150 to 175 ft. Unless the stations are marked on the rail for some other purpose, the simplest method of locating the stakes is to place them opposite every fourth or fifth joint, depending on the length of the rails, which simplifies their distribution since it permits them to be dropped from a hand car or motor car at regular intervals with no loss of time. Stakes set at every fifth joint on 30-ft. rails will have a spacing of 150 ft., while with 33-ft. rails, the interval will be 165 ft. With 39-ft. rails a spacing of four joints will give a distance between stakes of 156 ft. Experience has shown that there is no need of using a shorter interval than these distances, and that in some cases a distance of 200 ft. can be used, depending on the ability of the foreman in charge of the gang. Since all foremen are not equally proficient in lining track an interval of from 150 to 175 ft. will usually be found most satisfactory.

Painting in Hot Weather

What special precautions, if any, should be taken when painting the exterior of buildings in hot, dry weather?

Few Special Precautions Are Necessary

By Charles Ettinger
Supervisor Bridges and Buildings, Illinois Central, Chicago

No special precautions are necessary for successful painting in hot, dry weather; it is more necessary to take precautions in hot, damp weather. In hot, dry weather it is well to be liberal with the use of turpentine when the first coat is applied to the dry surface since the heat will cause quick setting of the paint and tend to prevent its proper penetration. The use of turpentine will assist in securing the desired penetration.

When very oily paint with no turpentine content is spread upon a hot, dry surface it will adhere to the outer surface only and the shrinkage from drying will pull the paint away from the surface, causing blisters. As these blisters dry out they break at the edges and cause peeling of the paint. When painting in hot, dry weather the paint should be brushed thoroughly to assist further in securing penetration

and adherence of the paint. With these precautions it is as easy to secure a good job in hot, dry weather as at any other time.

Resinous Woods Give the Most Trouble in Hot Weather

By Master Painter

The precautions to be taken when painting in hot, dry weather depend largely on the condition of the wood to which the paint is to be applied. In the case of well-seasoned wood it usually is necessary only to use plenty of turpentine in the priming coat so that the paint may penetrate the fibres of the wood. Many woods, especially those from coniferous trees, contain resin which is more readily brought to the surface by hot, dry weather. In such cases the turpentine dissolves the resins which otherwise would seal the pores of the wood against the paint. In extreme cases it may be necessary to apply a coat of turpentine alone to dissolve the resin a short time before the priming coat is put on. The priming coat should be well brushed to prevent peeling and blistering and to furnish a suitable ground for the succeeding coats, each of which also should be well brushed and given ample time to dry before the next coat is applied.

Should Track Tools Be Assigned Individually to Members of Gangs?

Is it practicable to assign individual tools to the members of section gangs to encourage better care of the tools?

The Section Man Who Takes an Interest in His Work Wants His Individual Tools

By J. B. Kelly

General Roadmaster, Minneapolis, St. Paul & Sault Ste. Marie, Minenapolis, Minn.

It is practicable and most desirable to assign individual tools to members of section gangs. Real section laborers need little encouragement in this respect while many others may be induced to adopt the practice if the foremen show the proper interest.

There are few cases in which the men themselves have not insisted on the assignment of individual tools and where this is not the situation the supervisory forces should insist that the foremen encourage individuality among the laborers in this respect with the majority of tools, such as shovels, picks, scuffle hoes, spike mauls, etc. When tools are not assigned the laborers have little regard for them and they are often left scattered at the end of the day's work, resulting in the loss of a number of the tools. When this condition prevails the quality of the work is apt to correspond to the manner in which the tools are treated.

Should Be Done to as Great an Extent as Possible

By Roadmaster

The proper care of track tools is important, not only from the standpoint of their cost, but also as concerns the efficiency of the work and the prevention of accidents among the men. For these reasons it is desirable that the responsibility for the condition of the tools be confined as closely as possible to the users and this can best be done by assigning the more commonly used tools to individual members of the gang, marking them in some simple way for identification. It is the foreman's business to see that tools are used properly, but it is impossible for him to do so at all times, and the assignment of individual tools to his men will enable him to fix the responsibility of their abuse and to take the proper measures for the correction of faulty methods.

Another advantage in this practice is the fact that many trackmen often prefer the tools they are used to, sometimes carrying this preference to the point that they are reluctant to give up some particular tool after it has passed its period of usefulness. Where such a spirit exists, and it is noticeable that it usually does exist among men who are interested in their work, it is well to encourage it since the man who prefers a particular tool will take care of it if he knows that he is to have the use of it regularly.

Outside Wooden Guard Rails for Bridges

Is an outside wooden guard rail necessary on bridges where an inside guard rail is used?

They Should Be Used on Open Deck to Space the Ties and as an Additional Safeguard

By F. H. Cramer

Assistant Bridge Engineer, Chicago, Burlington & Quincy, Chicago

It is good practice to put an outside wooden guard rail on all open floor bridges, regardless of whether an inside guard rail is used or not. Its purpose is not entirely to guard against derailments but also to space the ties properly and hold them securely in place, which are important factors. I know of several cases where an outside guard rail has held derailed trucks from going over the side of a bridge. Recently a truck under a coal car was derailed on one of our large bridges and the outside guard rail guided it for a distance of 800 ft. with little or no damage to the steel structure, which consisted of a draw and truss spans.

They Should be Used on All Open Timber Deck Bridges

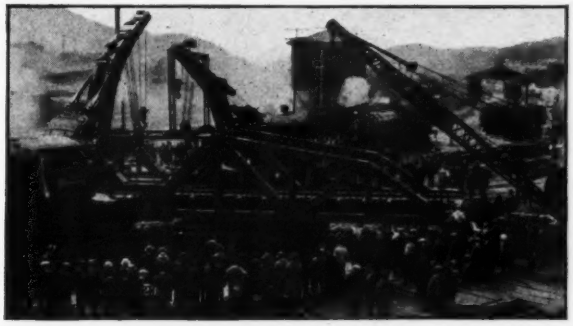
By P. G. Lang, Jr.

Engineer Bridges, Baltimore & Ohio, Baltimore, Md.

In discussing this question, it is assumed that an open tie floor bridge is referred to. The primary purpose of the inner guard rail is to hold derailed equipment in line and prevent its getting so far off line as to permit it to damage the bridge seriously, or, in extreme cases, to prevent it from falling from the bridge. Since this is the function of an inner guard rail, it would seem that such a guard rail should be used on all bridges, whether open tie floor or solid floor. The inner guard rail usually extends some distance beyond the ends of the bridge, its function being to hold derailed equipment in line and prevent it from seriously damaging the bridge.

The outer timber guard rail is used for a totally different purpose. The term "outer timber guard rail" should define any member, whether of timber or other material, which will maintain proper spacing of the ties in an open tie floor structure. This is necessary in order to prevent bunching of the ties in the event that a derailment occurs, which will, in turn, prevent portions of derailment equipment from falling below the level of the track, that is, through the ties, and seriously damaging cross members or other members in the floor of the bridge. It would seem, therefore, that an outer wooden guard rail is necessary on open tie floor bridges, even though an inside guard rail is used.

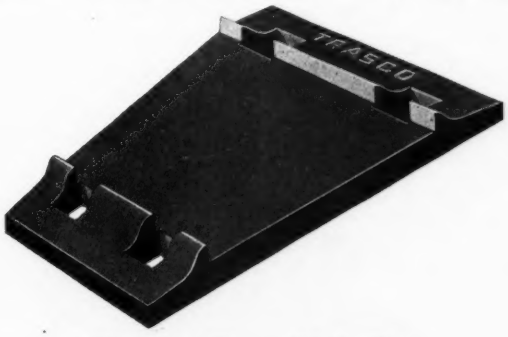
New and Improved Devices



An Eccentric Tie Plate Without a Long Heel

AN INGENIOUS and inexpensive means of providing the necessary eccentricity of a tie plate to equalize its bearing on the tie has been developed in a new plate that has been brought out by the Track Specialties Company, New York. Maintenance of way officers and manufacturers of tie plates have long recognized the necessity for designing a plate in such a manner that the center of gravity of the bearing area will lie outside the vertical plane through the web of the rail to coincide with the resultant of the vertical and lateral forces acting on the rail. This resultant is inclined in an outward direction and intersects the base of the rail outside the center line of the base as has been demonstrated by experience with the common tendency of rails to roll outward.

The solution of this problem in the design of a tie plate has been to proportion the plate in such manner that the center of gravity of the bearing area coincides with the point at which the resultant of the forces acting on the rail intersects the base of the plate. With a plate of rectangular outline as ordinarily used, this is



The Trasco Trapezoidal Tie Plate

accomplished by offsetting the plate with respect to the center line of the rail. In other words, it has a greater extension outside than inside the rail.

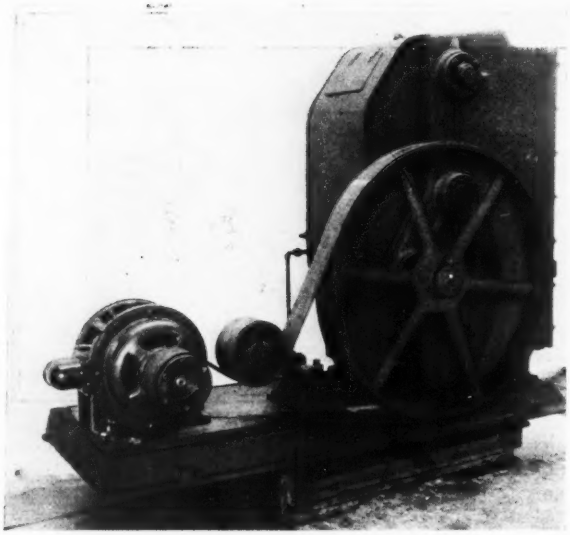
The new plate, which is known as the Trasco Trapezoidal tie plate is symmetrical in section about the center line of the plate, but is trapezoidal in plan, being wider along the edge outside the rail than on the edge along the gage side of the rail base. By this means, it is readily possible to locate the center of gravity of the plate-bearing area at a sufficient distance outside the center of the rail to coincide with the resultant of the forces acting on it, without extending it out as far as would otherwise be necessary. And inasmuch as the thickness of a tie plate is contingent upon obtaining enough stiffness in the extension to prevent it from bending up, plates of this design do not need to be as thick. It is claimed that the resulting saving in metal may be as much as 25 per cent. For instance, a Trasco trapezoidal tie plate 9 in. long, 8 in. wide on the outside and 5 in. wide on the inside, with the center of the rail coinciding with the center of the tie plate, is said to set into the tie with the same uniformity as a rectangular tie plate 10 in. long with an eccentricity of ½ in.

Plates of this design will be rolled from steel to meet specifications of the railroads and can be had in any non-patented type of base, although the present plan is to roll these plates with flat bottoms. The plates are punched for either three or four holes, as desired, but must have shoulders on each side as economy with beveled shearing demands that the plate be symmetrical in section. Plates of this design which have been subjected to tests are said to have settled with absolute uniformity.

A Continuous Flow Pump

OVER-LAPPING strokes and force-feed lubrication are outstanding features of a double-acting deep well pump developed by A. D. Cook, Inc., Lawrenceburg, Ind., which is now in service on a number of railroads. The motion is imparted to the upper and lower pump rod crossheads by means of two bell cranks actuated by two crank pins on a gear-driven shaft, the arrangement being such that each pump rod is lifted throughout 221 deg. of each revolution of the drive shaft, while the return on lowering stroke takes place in the remaining 139 deg. In other words, the pump employs the principle of the quick return motion commonly used on shapers and other machine tools. Thus each rod is in the uplift or pumping stroke for 61½ per cent of the time-and in the lowering stroke for only 38½ per cent of the time. This means that the uplift strokes of the two pump rods overlap during about 23 per cent of each revolution of the drive shaft. Consequently, the discharge of the pump is much more uniform than is the case with a pump in which the pump rods are connected to the crank pins by connecting rods.

The supporting frame of the pump head has the form of an enclosed box. This, with the base, comprises an oil retainer for the lubricating system. The base of the pump is hollowed out to form an oil reservoir from which the oil is drawn by a small pump which delivers it to a tilting pan at the top of the case. Here the oil is poured over the working parts and drips back into the reservoir at the bottom. A water baffle inter-



A PH Type Deep Well Pump in Service on the Great Northern at Rothsay, Minn.

posed between the oil reservoir and the stuffing box through which the pump rods pass, prevents water from getting into the oil.

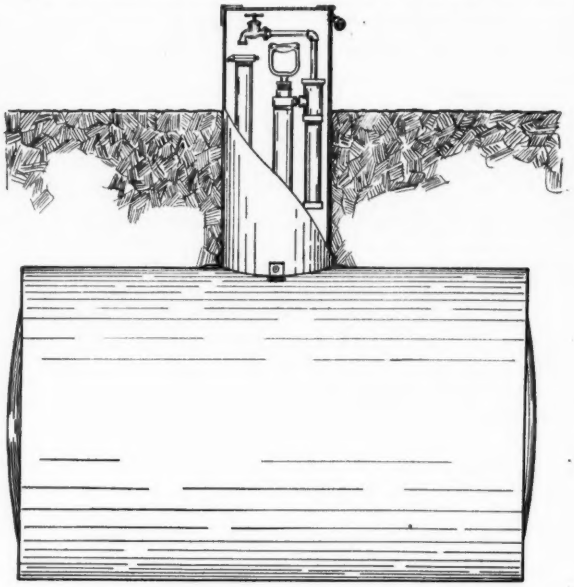
The center of gravity of the pump is low and in the case of direct drive or silent chain drive the motor is mounted on a motor base which is attached to the frame. The pumps may be had with gear, belt or silent chain drive and with either right or left side drive and are available in seven sizes, from the smallest, with a 7-in. stroke and a 3-in. diameter discharge to the largest which has a 22½-in. stroke and an 8-in. discharge. The shipping weight ranges from 900 lb. for the smallest size with a belt drive to 14,000 lb. for the largest size equipped with a chain drive.

There are a number of installations of pumps of this type on the railroads, including two on the Illinois Central at Clarksdale, Miss., one on the Louisville, Henderson & St. Louis at Cloverport, Ky., one on the Chicago, Rock Island & Pacific at Boise, Texas, two on the Detroit, Toledo & Ironton at St. Paris, Ohio, and one each on the Atlanta Birmingham & Atlantic at Westwood, Ga., the Reading at Williams Junction, N. J., and the Union Depot at Cincinnati, Ohio. The pump is known as the PH pump.

A Roadside Unit for Underground Oil Storage

THE Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa., has placed on the market a new roadside unit for the underground storage of gasoline and oil for maintenance of way forces or other purposes. The unit consists of a cylindrical steel tank, fitted with a steel hood which extends above the ground level and which houses a hand pump, a discharge pipe and a filling pipe. A hinged metal cover with a hasp is provided for the top of the hood, thus allowing it to be padlocked to prevent theft as well as to protect the parts from damage. The discharge pipe operates through a stuffing box so that it can be raised and turned to discharge into a receptacle outside the hood. The discharge pipe is fitted with a faucet to prevent dripping when the pipe has been turned back into the hood. The cap for the fill pipe is vented, thus eliminating the necessity of a separate vent pipe.

The tanks are built of steel plates, 3/16 in. thick, the cylindrical plates and each head being of one piece construction, with electrically welded seams. Each tank is painted with a protective coating having a bituminous base. The tanks are made in various sizes ranging from 75 gal. to 4,000 gal. and with weights from 365 lb. to 3,665 lb. Tanks of all the different sizes are kept in stock, assuring prompt shipment.



Installation of Underground Storage Tank for Oil

A New Electric Hand Saw

A NEW electric saw, designated as the Wallace hand saw, has been developed and placed on the market by J. D. Wallace & Co., Chicago, which is said to have demonstrated marked economies in cutting lumber for bridge and building work on the railroads where it has been placed in service.

In this device a universal motor is used, thereby adapting it to either direct or alternating current,

The Wallace Electric Hand Saw

and the motor is direct connected to the saw spindle to secure both efficiency and simplicity. Ball bearings of the same size and standard make are used throughout and the gears run in grease. The saw is a standard 8-in. blade with a round hole, which

can be easily obtained wherever blades are sold. The saw is fitted with two handles, one similar to the type used on ordinary hand saws and the other similar to that of a hand plane. Both are close to the saw blade, insuring accuracy and ease of operation. An indicator is provided on the front of the metal base supporting the saw and motor to aid in following a line, and a splitter, which drops into the saw cut behind the blade, also helps to guide the device. The base is machined on one side to follow a guide rail, and is so designed that the motor cannot be overloaded by using a larger blade than the power unit is intended to operate. A depth gage is provided so that the saw can be set to cut to any predetermined depth.

The saw blade is guarded at all points above the work at all times and an automatic guard which has been approved by the Underwriters' Laboratories protects it completely at other times. When a cut is to be made the operator releases the safety guard by means of a trigger placed conveniently near the grip. When the cut is finished and the saw is lifted from the work the safety guard drops automatically and locks in position from which it cannot be opened until released by the trigger, thus protecting not only those handling the saw from injury, but also the blade itself.

Directory of Associations

American Railway Bridge and Building Association.—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, October 18-20, 1927, Hotel Nicollet, Minneapolis, Minn.

American Railway Engineering Association (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Next convention, March 13-15, 1928, Chicago.

American Wood Preservers' Association.—E. J. Stocking, secretary, 111 West Washington street, Chicago. Next convention, January 24-26, 1928, Montreal, Que.

Bridge and Building Supply Men's Association.—B. J. Wilson, secretary, Pocket List of Railroad Officials, 1428 Lytton building, Chicago. Annual exhibit at convention of American Railway Bridge and Building Association.

National Association of Railroad Tie Producers.—E. A. Morse, secretary, Potosi Tie & Lumber Company, St. Louis, Mo. Next convention, April 24-26, 1928, Arlington Hotel, Hot Springs, Ark.

National Railway Appliances Association.—C. W. Kelly, secretary, 1014 South Michigan avenue, Chicago. Annual exhibit during convention of American Railway Engineering Association.

Roadmasters' and Maintenance of Way Association.—T. F. Donahoe, secretary, 428 Mansion street, Pittsburgh, Pa. Next convention, September 20-22, 1927, Hotel Statler, Buffalo, N. Y.

Track Supply Association.—A. H. Told, president, Positive Rail Anchor Company, Marion, Ind. Annual exhibit at convention of Roadmasters' and Maintenance of Way Association.

Pearl River Bridge on the Gulf, Mobile & Northern

With the Associations

The Roadmasters' Association

The members of the executive committee and the chairmen of committees will meet at the Hotel Statler, Buffalo, on July 30, to go over the reports of the committees and to prepare plans for the convention, which will be held in that city on September 20-22.

C. H. R. Howe, cost engineer on the Chesapeake & Ohio at Richmond, Va., has been appointed chairman of the Committee on The Collection and Use of Cost Data to succeed J. D. Keiley, whose death as a result of a motor car accident is noted in the news columns.

Bridge and Building Association

Information received from the chairmen of the eight committees shows that the reports of all of these committees will be completed well in advance of the convention, two of the reports now being in the hands of the secretary.

H. Heiszenbuttel, supervisor bridges and buildings, Chicago & North Western, Norfolk, Neb., has been appointed chairman of the committee to prepare a report on stock yards facilities, succeeding C. J. Scribner, whose death on July 13 is noted on a following page.

The Wood-Preservers' Association

Sixty members of the association gathered at Madison, Wis., on July 12-13 to attend meetings of various committees, including those of the Executive committee and the Committees on Preservatives, Material Handling and Pole Service Records. The Committee on Wood Preservation of the American Railway Engineering Association also met in Madison on the same day. A total of 67 were present at a dinner at the Maple Bluff Country Club on the evening of July 12. The following day was spent in an inspection of the Forest Products Laboratory at Madison and a study of the work in progress there.

The Engineering Association

Only four committees held meetings during the last month. The Committee on Grade Crossings met in Chicago on June 28; the Committee on Iron and Steel Structures at Albany, N. Y., on July 7-8; the Committee on Wood Preservation at Madison, Wis., on July 12-13; and the Committee on Masonry at Detroit, Mich., on July 21-22.

The association has undertaken the compilation of a comprehensive report on the Mississippi river floods which will include detailed reports of the damage inflicted on the various railways and the methods employed to cope with the disaster. Information has now been received from all but one or two of the roads affected and it is expected that the report will be ready for distribution late in August.

The Material Market

ORDERS for rails and track fastenings have again become an important feature of the iron and steel market. The new business in rails includes 65,000 tons for the Pennsylvania, 42,000 tons for the Southern, 15,000 tons for the Great Northern, 10,000 tons for the Canadian Pacific, and 9,000 tons for the Texas & Pacific. Prospective orders not yet placed include the requirements of the Chesapeake & Ohio and the Norfolk & Western, that of the latter aggregating 60,000 tons. The Northern Pacific is also reported as coming into the market for about 30,000 tons.

The track accessories business has fluctuated. In Chicago for the week ending July 9 it totaled 23,000 tons but was somewhat smaller during the following week, although a number of large orders are still pending. Among orders placed during the past few weeks are those of the Pennsylvania for 200,000 tie plates, and that of the Great Northern for 3,000 tons of tie plates and 1,500 kegs of spikes. The New York Central has also placed orders for tie plates, spikes and bolts.

Iron and Steel Prices Per 100 Lb.

	June		July	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	..... $2.80	..... $2.90	$2.80 to $2.90	..... $2.90
Track bolts, ⅞ in. and over	3.90 to 4.00	..... 3.90	..... 3.90	..... 3.90
Track bolts, ¾ in. and under	70% off list	70% off list	70% off list	70% off list
Angle bars	..... 2.75	..... 2.75	..... 2.75	..... 2.75
Tie plates, steel	..... 2.35	..... 2.35	..... 2.35	..... 2.35
Boat spikes	..... 3.25	..... 3.25	..... 3.10	..... 3.10
Plain wire	..... 2.40	..... 2.40	..... 2.40	..... 2.45
Wire nails, keg	..... 2.50	..... 2.55	..... 2.55	..... 2.60
Barb wire, galv.	..... 3.20	..... 3.25	..... 3.25	..... 3.30
C. I. pipe, 6 in. to 12 in., ton	.....	..... $42.20 to 43.20	.....	..... $41.20 to 42.20
Plates	1.80 to 1.85	..... 2.00	..... 1.80	..... 2.00
Shapes	1.80 to 1.85	..... 2.00	..... 1.80	..... 2.00
Bars, soft steel	1.80 to 1.85	..... 2.00	..... 1.80	..... 2.00
Rivets, struc	..... 2.75	..... 2.85	2.75 to 3.00	2.85 to 3.10
Concrete bars, billet	1.80 to 1.90	..... 2.15	1.80 to 1.90	.....
Concrete bars, rail	1.65 to 1.80	..... 1.90	1.65 to 1.80	..... 1.90
Rails, per gross ton, f.o.b mills	.....	..... 43.00	.....	..... 43.00

Steel Production Decreased During July

From the standpoint of production, however, the past month has been a quiet one. Rail production has dropped to 50 per cent of capacity, the output of spikes is also on a 50 per cent basis, and that of tie plates is about 75 per cent, having dropped from 100 per cent in two weeks.

Estimates of production for the entire steel industry place the output at about 67 per cent of capacity as compared with 75 per cent late in June. This reduction in output, together with a moderate increase in buying, is said to have had the effect of stiffening prices. The most outstanding evidence of this is the success attending efforts of the wire manufacturers to restore the prices on wire products after a reduction of five cents per 100 lb., during June. While deliveries on specifications against old orders are being made at the lower price, it is claimed that the restored quotations prevail on new business. The prices of plates, shapes and bars are said to be strong at $1.80 per 100 lb., Pittsburgh. Track fastening prices are also holding up but cast iron pipe has dropped $1 per month for three succeeding months. Structural rivets, on the other hand, have advanced 25 cents per 100 lb.

Scrap Prices Per Gross Ton at Chicago

	June	July
Relaying rails (including angle bars)	$26.00 to $31.00	$26.00 to $31.00
Rails for re-rolling	14.75 to 15.25	14.75 to 15.25
Rails less than 3 ft. long	15.00 to 15.50	15.50 to 16.00
Frogs and switches cut apart	13.00 to 13.50	13.25 to 13.75
Steel angle bars	13.00 to 13.50	13.25 to 13.75

Scrap prices are stronger, as indicated in the table for Chicago quotations. Competition for old material is strong in some markets but in others the movement is slow. In spite of the advance in price, manufacturers complain that the spread between the prices of old and new materials is too small.

Demand for Lumber Has Fallen Off

Current orders for Southern pine ranged from 65 to 82 per cent of normal during July, as compared with 80 to 100 per cent during July, 1926. It is claimed, however, that business has been more active in recent weeks, with more evidence of increased volume of sales in the late summer and fall. There have been some price concessions although these are not indicated in the table shown here. Conditions on the west coast are not as favorable. Curtailment of production for the purpose of avoiding excessive stocks in the face of a falling demand has resulted in increased manufacturing costs which have been a source of alarm because of concessions being made from the normal prices quoted herewith.

Southern Pine Mill Prices

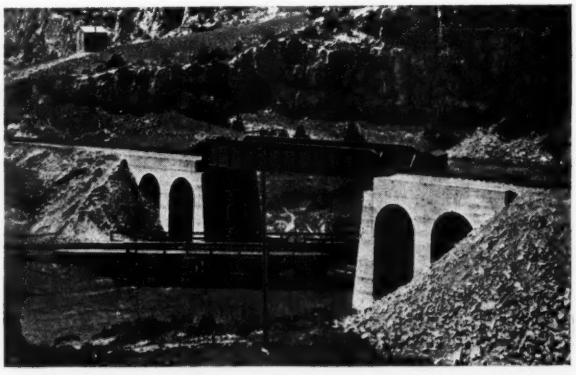
	June	July
Flooring, 1x4, B and B, flat	$40.42	$42.99
Boards, 1x8, No. 1	33.43	35.66
Dimension, 2x4, 16, No. 1, common	26.52	24.66
Dimension, 2x10, No. 1, common	26.00	29.58
Dimension, 2x4, 16, No. 1, common	23.78	21.83
Dimension, 2x10, No. 2, common	22.29	22.38

Douglas Fir Mill Prices

	June	July
Flooring, 1x4, No. 2 clear, flat	$27.00	$27.00
Boards, 1x8, 6 to 20, No. 1, common	16.00	16.00
Dimension, 2x4, No. 1, common	17.00	17.00
Dimension, 2x10, 16, No. 1, common	17.00	17.00
Timbers, 6x6 to 8x8, No. 1	20.00	20.00
Timbers, 10x10 to 12x12, rough	19.00	19.00

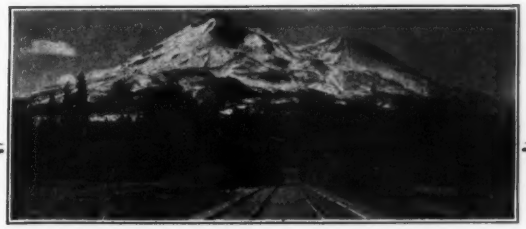
Prices of Portland cement have not been subjected to any change during the month. Quotations given below are per barrel in carload lots, not including package.

New York	$2.03	Minneapolis	$2.22
Pittsburgh	2.04	Denver	2.85
New Orleans	2.40	Dallas	2.05
Chicago	2.05	San Francisco	2.51
Cincinnati	2.32	Montreal	2.22



75-Ft. Through Girder Span with Arch Abutments Where the Chicago, Milwaukee & St. Paul Crosses the Northern Pacific and 16-Mile Creek in Montana

Railway News Briefly Told



The general offices of the Southern Pacific of Mexico are being removed from Tucson, Ariz., to Guadalajara, Son.

The net railway operating income of the Class I roads in May was $85,663,999, or at the rate of 4.70 per cent on the property investment, according to reports compiled by the Bureau of Railway Economics, as compared with $88,129,798, or 4.96 per cent, in May, 1926.

The main headings of the railroad section of the Moffat tunnel on the Denver & Salt Lake west of Denver, Colo., were holed through on July 7. On that date there remained approximately 2,700 ft. of bench to be removed. Owing to the nature of the ground no definite forecast has been made as to the date on which the tunnel will be ready for service.

The Illinois Central was damaged to the extent of $2,000,000 as a result of the recent Mississippi River floods, according to a statement by J. L. Beven, vice-president of that road. Through service between Memphis, Tenn., and Vicksburg, Miss., was resumed on July 3 over the Yazoo & Mississippi Valley, a subsidiary of the Illinois Central, after an interruption of approximately six weeks.

The total railway mileage of the world at the end of 1924 was 757,834 miles, according to a compilation translated by the Bureau of Railway Economics. Of this total, the United States had 250,966 miles, or 33 per cent, and the continent of North America had 316,652 miles, or 42 per cent. Europe had 237,664 miles, or 31 per cent, leaving 203,518 miles, or 27 per cent, for the rest of the world.

The railroads of the country paid into the United States Treasury during the fiscal year ended June 30 a total of $89,316,810 in principal and interest on their indebtedness incurred during the period of federal control and by loans made by the Interstate Commerce Commission afterward. Of this amount $68,628,774 was paid on account of principal, leaving a total railroad indebtedness of $230,484,076 at the beginning of the present fiscal year.

T. R. Conway, of Wilmot, Kan., who has been a section foreman on the St. Louis-San Francisco for 20 years, has received a letter from J. M. Kurn, president of the road, congratulating him on his remarkable record in preventing accidents among the men under his supervision. During his 20 years as a foreman on the Frisco, in which it is estimated that he and his men have performed more than 300,000 man-hours of work, neither he nor any of the laborers in his gangs have suffered a reportable injury.

Revenue freight car loadings for the week ended July 16 totaled 1,016,782, an increase of 177,474 cars over the preceding week which included the Fourth of July holiday. However, this was a decrease of 66,844 cars as compared with the corresponding week in 1926, but an increase of 86,069 cars over the same period in 1925. The cumulative total for the first 28 weeks of the current year was 27,182,816 cars as compared with 26,990,323 and 26,181,582 in the corresponding periods in 1926 and 1925 respectively.

A memorial tablet in honor of C. Shaler Smith, who designed and erected the Hanging Bridge over the Arkansas river in the Royal Gorge on the Denver & Rio Grande Western, was unveiled on July 18, before a party from the American Society of Civil Engineers, of which Mr. Smith was a member. The tablet was presented to the D. & R. G. W. by the six daughters of Mr. Smith, through the A. S. C. E. George T. Seabury, secretary of the society, made the presentation speech, and the tablet was accepted for the railroad by A. C. Shields, general manager. The tablet is attached to the end of one of the girders of the bridge where it may be seen by passengers, as all trains passing through the gorge in daylight stop 10 minutes at the bridge.

The Railroad Commission of California has ordered the Southern Pacific, the Atchison, Topeka & Santa Fe, the Union Pacific and the Pacific Electric to construct a union passenger station at Los Angeles, Cal. The time for the completion of the project is set at three years after the verification of the findings of the state commission by the Interstate Commerce Commission, while construction must start within 90 days of such verification. The Southern Pacific is directed to abandon all train movements except industrial switching on its line in Alameda street between College and East Fifteenth streets.

Arbitration hearings on the demand of the Brotherhood of Maintenance of Way Employees on the Chicago & North Western for an increase in pay of five cents an hour opened in Chicago on July 8 and are still in progress. About 13,000 men are involved. The chairman of the board of arbitration is Homer B. Dibell, chief justice of the Minnesota Supreme Court, and the other members are E. C. Davies, of Northwestern University, J. J. Farnum, office head, and E. E. Mileman, secretary of the brotherhood; William Walliser, vice-president, and C. H. Westbrook, assistant general auditor, of the Chicago & North Western.

The President's Conference Committee on Federal Valuation of the Railroads has filed with the Interstate Commerce Commission an application for a rehearing on the commission's order prescribing a system of depreciation accounting. The petition claims that the order is based on fundamental errors of both law and fact and asks that the carriers be permitted to present their views and evidence on the effect of the order in greater detail than was possible at the original hearing. The petition points out what the petitioner claims to be errors and states that these, together with other phases of the order, should be given further consideration by the commission.

A new law which has been passed in Florida requires all persons driving motor vehicles to "Stop, Look and Listen" before crossing railway tracks at grade, where such crossings are not within an incorporated city or town, or are not protected by gates or watchmen, and have been designated by the state road department as "dangerous." The law provides that the driver of the motor must come to a full stop within 50 ft. and not less than 10 ft. of such crossings and that he must "then look in both directions along the track and listen for the approach of any locomotive, car or train of cars." The railway company is required to put up suitable sign boards on both sides of the track, 200 ft. from the crossings, so arranged that the signs will reflect the lights of motor vehicle headlights at night. The law also provides that each locomotive "crossing or attempting to cross" a public highway covered by the act must be provided with a whistle, which must be blown in such a manner that the automobile driver who has complied with the law "will likely be warned thereby."

Personal Mention

General

F. S. Weisbrook, engineer of maintenance of way and structures of the Davenport, Rock Island & Northwestern, with headquarters at Davenport, Iowa, has been promoted to general manager, with headquarters at the same point, succeeding **C. B. Rodgers,** who has retired on account of ill health.

K. R. Ketcham, assistant engineer in the maintenance of way department of the Huntington and Logan divisions of the Chesapeake & Ohio, has been promoted to assistant trainmaster on the Sandy Valley and Elkhorn sub-division, with headquarters at Jenkins, Ky. Mr. Ketcham entered the service of the Chesapeake & Ohio on June 6, 1920, as a rodman in the construction department on the Logan division. On May 1, 1923, he was promoted to draftsman on location surveys, and served in this capacity until the fall of 1923 when he was transferred to Huntington, W. Va., as instrumentman on construction work. On December 15, 1923, he was promoted to draftsman in the office of the district engineer at Ashland, Ky., and on July 25, 1925, he was further promoted to assistant engineer in the maintenance of way department, the position he was holding at the time of his recent promotion to assistant trainmaster.

B. O. Johnson, assistant to the vice-president of the Northern Pacific, with headquarters at St. Paul, whose early training embraced both engineering and maintenance of way, has been promoted to assistant to the president, with headquarters at St. Paul. Mr. Johnson was born on May 25, 1878, at Worcester, Mass., and graduated from the Worcester Polytechnic Institute in 1900. He entered railway service in July of the same year as a track laborer on the Northern Pacific and during the following two years was employed in various positions in the engineering department. He was promoted to roadmaster in 1903 and in 1905 was appointed roadmaster on the Atchison, Topeka & Santa Fe. He returned to the Northern Pacific a year later as trainmaster and was promoted to superintendent of the Yellowstone division in 1909, subsequently being transferred to the Fargo and Montana divisions. He went to Russia in 1917 as a major in the railway corps of the United States Army, where he served for over five years, being advanced to colonel during his army service. Mr. Johnson was made assistant to the vice-president in charge of operation in 1923, which position he was holding at the time of his recent promotion to assistant to the president.

B. O. Johnson

Engineering

H. Israel, division engineer of the Illinois division of the Missouri Pacific, has moved his headquarters from Illmo, Mo., to Bush, Ill.

C. M. Cannon, division engineer of the South Florida division of the Seaboard Air Line, with headquarters at Arcadia, Fla., has been promoted to district engineer maintenance of way of the Southern district, with headquarters at the same place, to succeed **J. W. Sexton,** who has been transferred to the transportation department on the North Carolina division. **G. C. Rustell** has been appointed division engineer of the South Florida division, with headquarters at Arcadia, to succeed Mr. Cannon.

L. E. Peterson, roadmaster on the Southern Pacific at Redding, Cal., has been promoted to assistant division engineer of the Salt Lake division, succeeding **H. L. Archbold,** who has resigned.

A. H. Sturdevant, office engineer in the office of the district engineer of the Chicago, Rock Island & Pacific, at El Reno, Okla., has been promoted to division engineer of the Panhandle division, a newly created position, with headquarters at El Reno.

H. M. Hockman, assistant engineer on the Clover Leaf district of the New York, Chicago & St. Louis, has been promoted to division engineer on the Nickel Plate district, with headquarters at Cleveland, Ohio, succeeding **W. H. Burrage,** deceased.

R. P. Long, supervisor on the Wabash, with headquarters at Chicago, has been promoted to division engineer, with headquarters at the same place, succeeding **A. N. Crowe,** who has been transferred to Moberly, Mo., to take the place of **A. P. Gardner,** who has entered the service of the Ann Arbor.

C. E. Lindsay, assistant supervisor of bridges and buildings on the New York Central at Malone, N. Y., has been promoted to assistant division engineer on the Adirondack division, with headquarters at Utica, N. Y., to succeed **J. N. Grim,** whose promotion to supervisior of track is noted elsewhere in this issue.

C. J. Swane, assistant engineer on the Chicago, Milwaukee & St. Paul, with headquarters at Milwaukee, Wis., has been promoted to division engineer, with headquarters at Miles City, Mont., succeeding **E. Murray,** who has been apponted chief carpenter of the Madison division, with headquarters at Madison, Wis.

M. H. Brown, Jr., assistant division engineer of the Utah division of the Oregon Short Line, with headquarters at Pocatello, Idaho, has been promoted to division engineer of the Montana divison, wth headquarters at the same point succeeding **J. H. Smith,** who has been appointed assistant division engineer of the Utah division.

B. J. Simmons, assistant engineer on the Western Pacific, with headquarters at San Francisco, Cal., has been promoted to engineer maintenance of way, with headquarters at the same place. **T. L. Phillips,** assistant engineer at San Francisco, has been promoted to principal assistant engineer, with headquarters at the same place.

H. E. Stuckert, whose promotion to division engineer of the Houston North Shore, was noted in the July issue, was born at Portia, Ark., on March 8, 1896, and was educated at the George Washington and the Arkansas universities. He entered railway service in 1917 with the Missouri Pacific at Monroe, La. He served in the United States army from January, 1918, to June, 1919, and on his return to civil life entered the employ of the Gulf Coast Lines (now a part of the Missouri Pacific System). In July, 1926, he became an assistant engineer on the Houston Belt & Terminal (a subsidiary of the Missouri Pacific), which position he was holding at the time of his recent promotion to division engineer.

S. F. Grear, whose promotion to assistant engineer of bridges of the Illinois Central was noted in the July issue, entered railway service in 1907 as an engineering apprentice on that road at Louisville, Ky. He was promoted to rodman at Water Valley, Miss., later in the same year, and in 1909 was transferred to the office of the engineer of bridges at Chicago. He was later promoted to chief draftsman in that office, where he remained until December, 1921, when he was transferred to the chief engineer's office on special work in connection with state highway construction. On February 1, 1923, he was made assistant engineer and chief clerk in the engineering department, and on September 15, 1926, he was promoted to office engineer in the

chief engineer's office, which position he was holding at the time of his recent promotion to assistant engineer of bridges.

G. L. Sitton, chief engineer maintenance of way and structures of the Eastern Lines of the Southern, has had his jurisdiction extended to include the Memphis division, and the territories of the engineers maintenance of way have been redistricted. **G. P. Asbury**, engineer maintenance of way, with headquarters at Danville, Va., will have jurisdiction over the Danville, Richmond, Norfolk and Winston-Salem divisions. **G. E. Buckley,** engineer maintenance of way, with headquarters at Charlotte, N. C., will have jurisdiction over the Columbia, Charlotte, Spartanburg and Charleston divisions. **J. A. Killian,** engineer maintenance of way, with headquarters at Knoxville, Tenn., will have jurisdiction over the Memphis, Knoxville, Asheville, Coster and Appalachia divisions and also over the Riverton branch, the Knoxville & Augusta railroad and the Knoxville & Bristol railway. **R. Hayes,** engineer maintenance of way, with headquarters at Chattanooga, Tenn., will have jurisdiction over the Cincinnati, New Orleans & Texas Pacific, the Alabama Great Southern, the New Orleans & Northeastern, the New Orleans Terminal, the Cincinnati, Burnside & Cumberland River, the Harriman & Northeastern, and the Woodstock & Blocton. **E. Bennett,** roadmaster of the New Orleans & Northeastern and the New Orleans Terminal, with headquarters at Hattiesburg, Miss., has been promoted to engineer maintenance of way, with headquarters at Macon, Ga., and will have jurisdiction over the Atlanta division, the Georgia, Southern & Florida and the Florida & St. John's River Terminal, succeeding **J. S. Sharp,** resigned. **H. E. Tyrell,** engineer maintenance of way, with headquarters at St. Louis, Mo., will have jurisdiction over the St. Louis-Louisville district, and **R. D. Tobien,** engineer maintenance of way, with headquarters at Birmingham, Ala., will have jurisdiction over the Alabama district.

Mr. Bennett was born on May 26, 1886, at Irvington, Ky., and was educated at the Kentucky State University, where he graduated in 1909. He entered railway service on September 1, of the same year, serving as a rodman and transit man until September 1, 1912, when he was promoted to assistant engineer. He was further promoted to resident engineer on the Southwestern district on February 1, 1917, and when that position was abolished on April 1, 1920, he was again made assistant engineer. He served in that position until the latter part of 1925, when he was promoted to roadmaster of the New Orleans & Northeastern and the New Orleans Terminal, which position he was holding at the time of his recent promotion to engineer maintenance of way at Macon, Ga.

Track

Frank McInnerny, acting roadmaster on the Port Arthur division of the Canadian National, with headquarters at Transcona, Man., has been promoted to roadmaster, with headquarters at Portage La Prairie, Man., succeeding **E. C. Dunlop,** who has been transferred to Transcona.

R. S. Collins, acting roadmaster on the Atchison, Topeka & Santa Fe, with headquarters at Ottawa, Kan., has been promoted to roadmaster, with the same headquarters. **C. E. Ennis,** roadmaster at Rincon, N. M., has resumed his duties after a leave of absence of several months.

C. R. Gerard, assistant track supervisor on Division No. 3 of the Long Island at Jamaica, L. I., has been transferred as acting supervisor to Division No. 2, with the same headquarters, temporarily filling the place of **R. L. Haring,** supervisor, who has been granted a leave of absence on account of illness.

P. J. Weiland, whose promotion to roadmaster on the Chicago, Milwaukee & St. Paul, with headquarters at Ottumwa, Iowa, was noted in the July issue, was born on July 5, 1902, at Bridgewater, S. D. He entered railway service on April 1, 1916, as a section laborer at Bridgewater and on July 1, 1920, was promoted to section foreman at the same place, later being transferred to Mitchell, S. D. He was promoted to extra gang foreman on September 1, 1923, and on July 1, 1926, he was further promoted to assistant roadmaster on the I. & D. division, which position he was holding at the time of his recent promotion to roadmaster.

J. N. Grim, assistant division engineer of the Adirondack division of the New York Central, with headquarters at Utica, N. Y., has been promoted to supervisor, with headquarters at Remsen, N. Y., succeeding **O. C. Anderson,** who has been transferred to the Electric division at New York. Mr. Grim entered the service of the New York Central in 1900 as a transitman and has served as bridge and building inspector, assistant supervisor of track and assistant division engineer, holding the last named position at the time of his recent promotion to supervisor.

George A. Boyer, assistant engineer on the Beaumont division of the Southern Pacific, has been promoted to roadmaster of the Terminals division, with headquarters at Houston, Tex., succeeding **R. R. McDuff,** who has been transferred to the Yoakum district of the Houston division, with headquarters at Yoakum, Tex., succeeding **J. L. Lessor,** who in turn has been transferred to the Hearne district of the Dallas division of the Houston & Texas Central, with headquarters at Navasota, Tex., where he succeeds **J. V. Murphy,** resigned.

M. C. Groseclose, of the engineering department of the Chicago, Rock Island & Pacific, has been promoted to roadmaster, with headquarters at Waurika, Okla., to succeed **C. M. Webb,** who has been transferred to Ft. Worth, Tex., to take the place of **Jerry O'Connor,** retired. **B. F. Wright,** section foreman on the Kansas division, has been promoted to roadmaster, with headquarters at Topeka, Kan., and **J. E. O'Brien,** section foreman and former roadmaster on the Illinois division, has been promoted to roadmaster, with headquarters at Peoria, Ill., both newly created positions.

W. M. Swanson, whose promotion to roadmaster on the Chicago, Burlington & Quincy, with headquarters at Centerville, Iowa, was noted in the July issue, was born at Quincy, Ill., on July 8, 1876. He entered railway service on March 16, 1891, as a section laborer on the Quincy, Omaha & Kansas City and was promoted to section foreman at Durham, Mo., in 1895, being transferred later to Stahl, Mo., and Navinger. In 1902 he was employed on the construction of the Iowa & St. Louis (now a part of the Chicago, Burlington & Quincy), where he remained as section foreman after the road was placed in operation and which position he was holding at the time of his recent promotion to roadmaster.

C. R. Gates, track supervisor on the Southern, with headquarters at Birmingham, Ala., has been promoted to roadmaster of the New Orleans & Northeastern and the New Orleans Terminal, with headquarters at Hattiesburg, Miss., to succeed **E. Bennett,** whose promotion to engineer maintenance of way, with headquarters at Macon, Ga., is noted elsewhere in this issue. **J. H. Waters,** roadmaster on the Mobile division, with headquarters at Selma, Ala., has been transferred to the Birmingham division with headquarters at Birmingham, Ala., succeeding **S. E. Sims,** who has been moved to Selma to take the place formerly held by Mr. Waters.

Boyd Strauser, section foreman on the Bloomsburg division of the Delaware, Lackawanna & Western, at Bloomsburg, Pa., has been promoted to track supervisor on the Southern division of that road with headquarters at East Stroudsburg, Pa., succeeding **Murt Dowling,** who has been promoted to roadmaster on the same division, with headquarters at Stroudsburg, Pa., to succeed **Thomas Sexton,** who died on April 16. Mr. Strauser, who was born on September 14, 1881, at Bloomsburg, entered railway service as a section laborer on the Lackawanna, at Bloomsburg, in 1899. On October 6, 1904, he was promoted to section foreman on the Bloomsburg division, with the same headquarters, and has held this position until his recent promotion to track supervisor.

Mr. Dowling, who was born at Stewartsville, N. J., on May 30, 1875, entered railway service with the D., L. & W. as a section laborer on May 1, 1893, at Stewartsville,

and on March 1, 1899, was promoted to section foreman, acting in that capacity until 1901, when he was placed in charge of a switch and construction gang. In 1915 he was promoted to supervisor, with headquarters at Stroudsburg, and on April 16, 1927, was promoted to acting roadmaster, with the same headquarters. He held the latter position until July 1, 1927, when he was appointed roadmaster, succeeding Mr. Sexton.

L. B. Woods, assistant on an engineer corps on the Pennsylvania, has been promoted to assistant supervisor, with headquarters at Buffalo, N. Y., succeeding **F. A. Dever,** who has been transferred to the Pan Handle division, with headquarters at Dennison, Ohio, a newly created position. **P. C. Smedley,** assistant on the engineer corps on the Philadelphia Terminal division of the Pennsylvania, has been promoted to supervisor on the New York division, succeeding **D. B. Jones,** who has been assigned to duties in the division engineer's office. **W. D. Brackett,** assistant on the engineer corps on the Conemaugh division, has been promoted to assistant supervisor on the Trenton division, with headquarters at Jamesburg, N. J., to take the place of **E. C. Waters,** who has resigned. **C. S. Hager,** on special duty in the office of the engineer maintenance of way of the Philadelphia division, has been assigned to handle the duties of the supervisor at Williamsport, Pa., in the place of **W. S. Springer,** who is in ill health.

Robert Ashley, whose appointment as roadmaster on the Chicago & North Western, with headquarters at Antigo, Wis., was noted in the July issue, was born on August 3, 1886, at Roanoke, Va., and entered railway service on April 1, 1905, as a water boy on the Lexington & Eastern (now a part of the Louisville & Nashville). He entered the service of the North Western on April 1, 1914, as a section labor at Crandon, Wis., and was promoted to section foreman at Pelican, Wis., on April 1, 1915. He was further promoted to extra gang foreman on May 1, 1916, and acted in this capacity during the summers until November 24, 1924, when he was promoted to assistant roadmaster at Ironwood, Mich., which position he was holding at the time of his recent promotion to roadmaster.

D. J. Russell has been appointed roadmaster on the Portland division of the Southern Pacific, with headquarters at Oakridge, Ore., in the place of **C. H. Neal,** who has been transferred to Redding, Cal., to succeed **L. E. Peterson,** who has been promoted to assistant division engineer on the Salt Lake division. **H. H. Brookfield** has been appointed roadmaster of the Truckee district of the Sacramento division with headquarters at Truckee, Nev., to replace **F. D. Dutton,** who has been transferred to the San Francisco district of the Coast division, with headquarters at San Francisco, Cal., a newly created position. **C. N. Myrick** has been appointed roadmaster of the Suisun district of the Western division, succeeding **J. F. Gallagher,** who has been transferred to the Port Costa district, with headquarters at Oakland Pier, Cal., a newly created position.

V. H. Carruthers, whose appointment as roadmaster on the Canadian Pacific, with headquarters at Weyburn, Sask., was noted in the June issue, was born on June 27, 1893, at Harcourt, N. B., and was educated at the University of Toronto. Mr. Carruthers entered railway service during the summer of 1913 as a rodman on the Intercolonial (now a part of the Canadian National) and served in that position and as topographer with that road during his school vacations in 1913, 1914 and 1915. He was in military service with the Canadian artillery in England and France from May 2, 1916, until March, 1919. On his return to Canada he entered the service of the Canadian Pacific as a rodman and later was promoted to instrumentman, being employed by that company during the summer vacations of his course at the University of Toronto. From October, 1923, to January 1, 1924, he was assistant foreman on construction at Foam Lake, Sask., becoming instrumentman on maintenance of way on the latter date at Kenora, Ont. From January, 1925, to April of the same year he was instrumentman on maintenance of way on the Illinois Central at Fulton, Ky., and Champaign, Ill. Returning to the Canadian Pacific in April, 1925, he resumed his position as instrumentman at Kenora and in October, 1925, was promoted to acting roadmaster, with headquarters at Virden, Man. He was advanced to roadmaster, with headquarters at Ft. William, Ont., in March, 1926, and in August of the same year was appointed roadmaster on the Kettle Valley, with headquarters at Princeton, B. C., which position he was holding at the time of recent appointment as roadmaster on the Canadian Pacific, with headquarters at Weyburn, Sask.

Changes on the New York, New Haven & Hartford

As a result of a recent revision of the territories on the Boston and Midland divisions of the New York, New Haven & Hartford, one supervisor has been eliminated, and the following changes have been made: **C. W. Rogers,** track supervisor, with headquarters at South Braintree, Mass., has been transferred to Providence, R. I., succeeding **J. Gigliotti,** who has been transferred to New London, Conn., taking the place of **T. A. Londregan,** who was recently retired on a pension and who died on June 11, as noted elsewhere. **W. F. Sullivan,** supervisor at Boston, has been transferred to South Braintree, with the following jurisdiction: Boston Terminal to Middleboro, Mass.; West Quincy branch; Braintree Highlands, Mass., to Stoughton Junction; and Neponset to Mattapan. **H. O. Quigley,** supervisor, with headquarters at Boston, has been given jurisdiction including Boston Terminal to Readville Transfer; Boston Freight Terminal to Ashcroft; and Forest Hills to Readville, via Dedham. The jurisdiction of **D. Maconi,** track supervisor at Franklin, Mass., has been changed to include Ashcroft to Willimantic; Cook street to East Blackstone, Mass.; Franklin to Ashland; and West Roxbury to Needham Junction.

Purchasing and Stores

T. N. McKeown, assistant purchasing agent on the Canadian Pacific, with headquarters at Victoria, B. C., has been promoted to purchasing agent, with headquarters at the same place. **William Bell,** commissary purchasing agent, with headquarters at Victoria, has been promoted to assistant purchasing agent to succeed Mr. McKeown.

Frank S. Austin, general storekeeper of the Boston & Albany, with headquarters at West Springfield, Mass., has been promoted to purchasing agent, with headquarters at Boston, Mass., succeeding **Frederic A. Ryer,** who has retired. **George E. Johnston,** storekeeper at Allston, Mass., has been promoted to general storekeeper, with headquarters at West Springfield to succeed Mr. Austin.

Bridges and Buildings

C. P. Gilmore, general supervisor of maintenance of way and structures of the Western Pacific, with headquarters at Oakland, Cal., has been appointed general supervisor of bridges and buildings, with headquarters at the same place.

C. M. Setzer, bridge and building foreman on the Charlotte division of the Southern, with headquarters at Gainesville, Ga., has been promoted to assistant bridge and building supervisor on the same division, with headquarters at Greenville, S. C., succeeding **B. O. Wooley,** deceased.

E. Murray, division engineer on the Chicago, Milwaukee & St. Paul, with headquarters at Miles City, Mont., has been appointed chief carpenter on the Madison division, with headquarters at Madison, Wis., succeeding **N. Gregory,** who has been assigned to other duties.

C. L. Lowell, inspector of bridges and buildings on the Adirondack division of the New York Central, Malone, N. Y., has been promoted to assistant supervisor of bridges and buildings, to succeed **C. E. Lindsay,** whose promotion to assistant division engineer of the same division, with headquarters at Utica, N. Y., is noted elsewhere in this issue. **F. J. Dutcher,** assistant supervisor of track on the Syracuse division, with headquarters at East Buffalo, N. Y., has been appointed inspector of bridges and buildings to succeed Mr. Lovell.

B. F. Cary, whose promotion to bridge and building supervisor on the Southern, with headquarters at Alexandria, Va., was noted in the June issue, was born on December

16, 1888, at Bullock, N. C. He entered railway service on October 15, 1906, as a bridge and building laborer on the Southern and became a bridge and building carpenter on June 1, 1907. He was promoted to assistant foreman on August 15, 1908, and was further promoted to foreman on May 31, 1910, serving in this position until January 1, 1926, when he was promoted to track supervisor. He was made assistant bridge and building supervisor on March 15, 1926, and on October 15 of the same year was again appointed track supervisor. He was made assistant bridge and building supervisor on January 1, 1927, in which position he was serving at Keysville, Va., at the time of his recent promotion to bridge and building supervisor at Alexandria.

Obituary

C. J. Scribner, assistant engineer of scales on the Chicago, Burlington & Quincy, with headquarters at Chicago, died in that city on July 13.

T. A. Londregan, track supervisor on the New York, New Haven & Hartford, with headquarters at New London, Conn., who was retired on a pension early in the year, died on June 11.

O. Halling, supervisor on the Chicago Great Western, with headquarters at Red Wing, Minn., was killed near Cannon Falls, Minn., when a weed mowing machine on which he was riding was struck by a locomotive.

Peter M. Swenson, superintendent of bridges and buildings on the Minneapolis, St. Paul & Sault Ste. Marie, died at his home in Minneapolis, Minn., on July 22. Mr. Swenson, who was born in Sweden in 1861, came to this country in 1881 and was in the employ of the Soo Line since 1886.

John D. Keiley, division engineer on the Chesapeake & Ohio, with headquarters at Clifton Forge, Va., was killed in a railway motor car accident on June 8. Mr. Keiley was born on April 19, 1898, at Asheville, N. C., and was educated at the Brooklyn Polytechnical Institute, following which he was connected with the Guaranty Trust Company, New York, for one year. He entered railway service in the statistical department of the New York Central and later was employed in the maintenance of way department. He entered the service of the Chesapeake & Ohio in April, 1922, as an assistant engineer at Richmond, Va., and was promoted to supervisor, with headquarters at Russell, Ky., in 1924. In May of the present year he was further promoted to division engineer, with headquarters at Clifton Forge, Va., which position he was holding at the time of his death. Mr. Keiley was chairman of the Committee on the Collection of Cost Data of the Roadmasters' Association.

John D. Keiley

George E. Bitz, general supervisor of bridges on the New York Central, Lines West, with headquarters at Cleveland, Ohio, whose death on March 13 was noted in the May issue, was born on January 27, 1864, at Monroe, Mich., and entered the service of the New York Central as a carpenter in the bridge department on April 16, 1885. He was promoted to assistant bridge foreman in 1889 and in 1897 was further promoted to inspector of bridges. He afterward became a local inspector in the office of the bridge engineer and in 1918 he was made assistant bridge inspector, with headquarters at Cleveland. He was later made general supervisor of bridges, Lines West, which position he was holding at the time of his death.

Construction News

The Atchison, Topeka & Santa Fe has awarded a contract to the McClintic-Marshall Company, of Pittsburgh, Pa., for the construction of shop buildings at Cleburne, Texas. This work involves the use of about 2,800 tons of steel.

The Atlantic Coast Line has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a 500-ton Simplex automatic electric coaling station at Lakeland, Fla.

The Baltimore & Ohio has awarded a contract to Sheesley & Janney of Johnstown, Pa., for work on the elimination of a grade crossing on Paddock road, Cincinnati, O., which will cost $135,000. A contract has also been let to the Vang Construction Company, Cumberland, Md., for a part of the same project, to cost about $30,000.

The Toledo & Cincinnati, a subsidiary of the B. & O., has applied to the Interstate Commerce Commission for authority to construct an extension of 4.3 miles from Hamilton Furnace, in Butler county, Ohio.

The Bessemer & Lake Erie has received bids for the construction of a reinforced concrete overhead highway bridge at Shermansville, Pa., which will cost around $118,564.

The Canadian National has awarded a contract to the Tomlinson Construction Company, Winnipeg, Man., for the construction of a line between a point near Sturgis, Sask., and Hudson Bay Junction, with a branch from a point on this line to a point between Crooked River, Sask., and Mistatim, a total of about 132 miles.

A contract has been let to the Campbell Construction Company, Winnipeg, Man., for clearing the right of way, grading and construction of culverts for a belt line at Saskatoon, Sask., to have a total length of about 7 miles. A contract for clearing the right-of-way, grading and construction of culverts for a line between Weyburn, Sask., and Radville, 23 miles, has been awarded to Hett & Sibbald, Ltd., and Bryson Brothers, Prince Albert, Sask. The cost of this project is estimated at $570,000. The Campbell Construction Company, Calgary, Alta., has been awarded the contract for grading and construction of culverts for a line from Shell Brook, Sask., west to a point west of Shell Lake, Sask., 77 miles. Expenditures necessary for the completion of the entire line are estimated to total about $2,480,000.

A contract for the construction of a line from a point near Spruce Lake, Sask., through Le Claire, Sask., to the North Saskatchewan river, 30 miles, has been let to Dutton & Mannix, Winnipeg, Man., at an approximate cost of $990,000. Stewart and Cameron, Ltd., Winnipeg, have been awarded a contract for the grading and construction of culverts for a line from Elk Point, Alta., east to the North Saskatchewan river, 19 miles, at an estimated cost of $745,000. The same contractor will grade and construct culverts for a line from a point east of Ashmont, Alta., east to Bonnyville, 38 miles. The total cost of this extension is estimated to be $1,415,000.

Bids closed on July 21 for clearing the right-of-way, grading and construction of culverts on the Sturgis-Peesane branch, 79 miles, and on the Willowbrook Northwesterly branch, 22 miles, in Saskatchewan, and on the Bretona-Cloverbar cut-off, 11 miles, in Alberta.

Bids closed on July 29 for the construction of a coaling station of 100-ton capacity at Hope, B. C.

The Canadian Pacific has awarded a contract for the construction of a 2,000,000-bu. addition to the grain elevator at Port McNicoll, Ont., which will include necessary working house facilities.

A contract has been let to the Dominion Construction Company for a nine-mile double-track line diversion, extending from Esher to Healy, west of Chapleau, Ont.

A contract for the grading of the line extension from

Rosetown, Sask., to Perdue, 31 miles, has been let to Dutton & Mannix, Winnipeg, Man. Pile trestle work on this extension and on the extensions from Maxstone, Sask., west 30 miles, and from Asquith, Sask., northwest 20 miles, will be done by Duff, Flint & Co., Winnipeg.

A contract for the construction of a branch line between Foam Lake, Sask., and Duval, 75 miles, has been let to W. P. Dutton & Co., Winnipeg, Man.

The Chesapeake & Ohio has awarded a contract to the U. G. I. Contracting Company for the sub-structure of a new railroad bridge across the Ohio river between Cincinnati and Covington O. This work is to cost $500,000 and includes, besides other work, the installation of several large piers in the Ohio river under 40 to 50 ft. of water.

The Chicago & North Western has reached an agreement with the city of Chicago for the construction of three highway subways under the tracks at Peterson and Rogers avenues. The estimated cost is $375,000, of which about $108,000 will be paid by the city.

The Chicago, Rock Island & Pacific has awarded a contract for the construction of locomotive repair shop facilities, including a one-story machine shop addition, at Silvis, Ill., at a cost of about $125,000, to the T. S. Leake Construction Company, Chicago.

Plans have been prepared for the construction of a reinforced concrete and steel bridge, 2,400 ft. long, over the Canadian river near Fritch, Tex., the floor of which will be 152 ft. above water level. The cost of the entire structure is estimated at $1,000,000.

The Delaware, Lackawanna & Western has made plans for a new passenger station at Paterson, N. J., to cost around $100,000 and will close bids on this work August 1.

The Erie has let a contract to the Newhall Construction Corporation, of Cleveland, O., for the building of a stock-feeding station at Buffalo, N. Y. The work involves the building of pens, 500 ft. long by 150 ft. wide, and also feed barns and a small office building. The cost of the work will be approximately $100,000.

This road and the Pennsylvania have made plans for the elimination of grade crossings on their lines at Akron, O.

The Florida East Coast is contributing to the cost of two overhead bridges to eliminate grade crossings at Vero Beach, Fla., and Olympia. The bridges are being built by the state highway department at an estimated cost of $112,000.

The Great Northern has filed with the Interstate Commerce Commission applications for authority to assume the obligation of the Oregon Trunk under the commission's certificate and order to build the proposed line from Bend to Paunina, Ore., and also for authority to operate under an agreement with the Southern Pacific and Central Pacific over their Natron cut-off from Paunina to Klamath Falls, Ore., and a track of its own serving industries in Klamath Falls and connecting with the terminals of the Oregon Trunk. The Great Northern proposes to use a somewhat different route from that proposed by the Oregon Trunk, operating over a logging road of the Shevlin-Hixon Company for 25 miles south of Bend, in which it proposes to buy a three-fourths interest for $375,000.

Contracts for the installation of a treating cylinder, storage tanks and working tanks at the tie-treating plant under construction at Hillyard, Wash., have been let to the Puget Sound Machinery Depot, Seattle, Wash., and to the Williams Brothers Company, Minneapolis, Minn. A steel building for housing the adzing, boring and incising machinery will be constructed by the Union Iron Works, Spokane, Wash. Company forces are employed in the major part of the construction.

The Gulf & Ship Island has applied to the Interstate Commerce Commission for authority for the construction of a 150-mile line extending from a connection with the main line of the G. & S. I. at Mendenhall, Miss., in a general northerly direction through Kosciusko, Miss., Zama, Carthage, Canton, and Pelatachie, to serve a lumber traffic.

The Kansas City, Mexico & Orient has accepted a gift of 320 acres of land from the citizens of Presidio, Tex., to be used as a site for shops, roundhouse, and a station for the line now under construction between Las Norias, Chihuahua, and the Rio Grande.

The Kansas City Terminal has awarded a contract to the List & Weatherly Construction Company for the construction of the Van Brunt boulevard subway under eight tracks of this company at Kansas City, Mo. The approximate expenditure is $290,000.

The Lehigh Valley has been ordered by the New Jersey Board of Public Utility Commissioners to eliminate the grade crossings of two of this company's three tracks at Frelinghuysen avenue, Newark, N. J. The Pennsylvania, which has two tracks across this street at this point, will participate in the necessary work. The total cost is estimated at $514,867.

This road plans to let further contracts shortly for pier construction in connection with the Lehigh Valley-Pennsylvania Bridge over Newark Bay. It also plans the construction of a number of small bridges on its line at different points in New Jersey.

The Lehigh Valley and the Pennsylvania have given a contract to the Arthur McMullen Company, of New York, for the construction of four main piers on pneumatic caisson foundations for the bridge across the Newark bay. The approximate cost of work covered by this contract is about $1,000,000.

The Missouri Pacific has purchased a grain elevator of 460,000-bu. capacity at Omaha, Neb., which will be enlarged to a total capacity of 1,000,000-bu.

A contract has been awarded to the Foundation Company of Missouri, Kansas City, Mo., for the construction of a water station and treating plant at Hermann, Mo.

The Mound City & Eastern has applied to the Interstate Commerce Commission for authority to build a new line from Mound City to Leola, S. D., approximately 70 miles. Julius Rosholt, 615 Metropolitan Life Bldg., Minneapolis, Minn., is president of the company.

The New York Central has awarded a contract to James Stewart & Co., for the erection of a 35-story office building to bridge Park avenue between 45th and 46th streets, N. Y. The building was designed by Warren & Wetmore, architects, and will cost $9,000,000. The structure, which will contain stores and will have frontages on Vanderbilt and Park avenues, is linked up directly with the plan to eliminate the bottle-neck traffic situation at the north end of the Grand Central Terminal by the opening of Depew Place. A separate contract for a roadway running through the building has been let to James Stewart & Co.

Bids closed on July 12 for the building of a new passenger station at Buffalo, N. Y., to cost around $3,000,000.

H. R. Beebe, Inc., of Utica, N. Y., has been awarded a contract for the alteration and additions to an inspection shed at West Albany, N. Y. Another contract has been awarded to the Lyons-Slattery Company, Inc., of New York City for the filling for main line tracks at the north approach to Dyckman Street bridge at New York. A contract has been awarded to E. J. Doyle, White Plains, N. Y., for the construction of an outlet drive and plaza extension at Hartsdale, N. Y. A contract has also been let to the John Johnson Construction Company of Buffalo, N. Y., for passenger yard drainage at Buffalo, N. Y. Wm. M. Ballard, Inc., of Syracuse, N. Y., has been awarded a contract for the remodeling of pit and furnishing and placing a 110-ft. turntable, at Rensselaer, N. Y.

A contract has been let to the Ogle Construction Company, Chicago, for the construction of a 50-ton, one-track, electric, steel coaling station at Olivers, Ind. The same contractor has been awarded a contract for the installation of a one-track, electric cinder plant at the same point.

The New York, Chicago & St. Louis has announced plans for the construction of a freight terminal at Cleveland, O., involving a total expenditure of about $10,000,000, following a decision in the United States District Court at Cleveland, upholding the right of the railroad to condemn land to be used as a site for the project. The freight house

proper will have outside dimensions of 150 ft. by 824 ft., and will be located along Broadway avenue, between Central avenue and East Twenty-fifth street.

The New York, Westchester & Boston has awarded a contract to Dwight P. Robinson & Co., of New York, for double-tracking its line from Harrison to Rye, N. Y.

The Northern Pacific has been authorized to abandon that portion of its Bitter Root branch from Florence to Hamilton in Ravalli County, Mont., 25.77 miles, on the west side of the Bitter Root river and to construct a line between the same points on the east side of the river. The carrier contended that the location on the east side of the river was nearer the agricultural center of the valley and that the proposed change would promote development in agriculture, dairying and general industry.

The Oregon Trunk has awarded a contract for the construction of a line from a point 25 miles south of Bend, Ore., to Chemult, 45 miles, to Hauser Brothers Construction Company, Portland, Ore.

The Panhandle & Santa Fe has been authorized to construct a line of railroad in Carson and Hutchinson counties, Tex., from White Deer, in Carson county, thence north and northwest to a point in Hutchinson county, a distance of 21 miles. Construction costs are estimated at $921,900 for the first section including 15 miles of sidings, and $1,032,400 for the second section, including 12 miles of side tracks.

The Pennsylvania has awarded a contract to A. N. Spooner & Son, Inc., New York, for the reconstruction of Pier K at Jersey City, N. J., to cost about $600,000. A contract has also been let to J. G. Kenan Co., Cleveland, O., for the construction of a bridge carrying this road's tracks over the Nickel Plate near Seventy-ninth street, Cleveland O., which will cost around $180,000. A contract has been awarded to W. F. Trimble & Sons Co., Pittsburgh, Pa., for grading work at Sewickley, Pa., which it is estimated, will cost $100,000.

The Piedmont & Northern is making plans to complete connecting links between Spartanburg, S. C. and Gastonia, N. C., a distance of 56 miles, and between Charlotte and Winston-Salem, N. C., a distance of 70 miles.

The Reading has prepared plans for a $2,000,000 passenger express station to be erected at Broad and Huntingdon Streets, North Philadelphia, and to serve as the pivotal point for the Reading's service to New York. The North Philadelphia Station, which is expected to be in use within 18 months, will replace the present north and southbound stations in Huntingdon Street and become the company's only general express stop inside the city limits.

This company plans to erect a new freight and passenger terminal at Lansing, Pa.

The San Benito & Rio Grande Valley has awarded a contract for the construction of line from Fernando, Tex., eastward 6 miles to the Gulf of Mexico to the W. T. Montgomery Company, San Antonio, Tex. Another contract has been let to the W. H. Nichols Company, Dallas, Tex., for the construction of a line from San Benito, Tex., eastward 18 miles to Laguna Vista on the Gulf of Mexico.

The Southern Pacific has awarded contracts aggregating approximately $240,000 for stations and other buildings on its recently completed Rio Grande Valley extension in Texas, as follows: To the Ware Company, Houston, Tex., $100,000; to R. W. Abbott, McAllen, Tex., $120,000; to William D. Uecker, $20,150.

A contract has been awarded to the G. E. and E. E. Reiman Company, New Orleans, La., for the construction of a two-story reinforced concrete, brick and steel fruit warehouse on Front street at Julia street, New Orleans. The cost of the structure, which will include an office building attached to the warehouse, will be about $100,000.

The Tulsa, Wewoka & Southern has applied to the Interstate Commerce Commission for a certificate for the construction of a line of approximately 220 miles, between Tulsa and Ardmore, Okla., passing through or near Okemah, Wewoka and Ada. S. S. Orwig, of Wewoka, is president.

Supply Trade News

General

The Pittsburgh Testing Laboratory has moved its office and laboratory at Birmingham, Ala., to a new building where a Riehle testing machine of 400,000-lb. capacity has been installed.

The Bucyrus Company, South Milwaukee, Wis., and the **Erie Steam Shovel Company,** Erie, Pa., are to be merged, and a new company will be organized to take over the assets of the present companies.

The American Rolling Mill Company, Middletown, Ohio, has purchased the Columbia Steel Company and the Forged Steel Wheel Company of Pittsburgh, Pa., subsidiaries of the Standard Steel Car Company. This company has moved its St. Louis offices from the Boatman Bank building to 901 Ambassador building.

The Air Reduction Company, Inc., New York, has bought the business, insofar as the manufacture and sale of oxygen, acetylene and similar products are concerned, of the United Gas Improvement Contracting Company, a subsidiary of the United Gas Improvement Company, and the United Oxygen Company, Philadelphia. The purchase includes oxygen plants at Philadelphia, Pa., Chester, Milton, Enola and Reading and an acetylene plant at Bridgeport, Pa.

Personal

Eckley H. Stearns, New York manager for the Adams & Westlake Company, has retired from active interest in that concern.

F. K. Armstrong, of the New York sales branch of the Ingersoll-Rand Company, has been promoted to manager of the branch office which that company has opened at Newark, N. J.

William Charles Kidd, sales representative of the Ramapo Ajax Corporation, Hilburn, N. Y., died at his home in Suffern, N. Y., on July 5, after an illness of several months.

William Charles Kidd

Mr. Kidd, who was widely known among railway and supply men as "Captain Kidd," was born on April 23, 1858, in Burnley, England. In 1881 he entered the employ of the Ramapo Iron Works (now the Ramapo Ajax Corporation) at Hilburn as a machinist, where he was instrumental in the development of the Ramapo automatic switchboard. He later entered the sales organization of the company, with which he had been connected for more than 25 years at the time of his death. Mr. Kidd was secretary-treasurer and a particularly active member of the Track Supply Association, the organization of supply concerns which exhibit at the annual conventions of the Roadmasters' and Maintenance of Way Association. He was also one of the founders of the Metropolitan Track Supervisors' Club, New York, in 1921, and was secretary-treasurer of that organization from its beginning until early this year when he was made honorary secretary-treasurer for life.

S. F. Graver, vice-president and treasurer of the Graver Corporation, East Chicago, Ind., has been elected presi-

dent and treasurer, succeeding as president, **J. P. Graver**, who remains as second vice-president. **K. W. Bartlett**, general manager, has been elected third vice-president and **A. E. Lucius**, of Lucius, Buehler & Lucius, Chicago, legal representatives of the company, has been appointed assistant secretary.

Charles F. Simpson has been appointed district engineer for Tennessee for the Portland Cement Association, with headquarters in the Cotton States building, Nashville, Tenn.

M. J. Harkless has been appointed sales engineer of the contractors' department of the Independent Pneumatic Tool Company, Chicago. Mr. Harkless was formerly an engineer in the railway and marine supply department of the Buda Company, Harvey, Ill.

Burton L. Delack, assistant manager of the Schenectady works of the General Electric Company, has been promoted to acting manager to succeed **C. E. Eveleth**, who has been elected vice-president. **Edward A. Wagner**, managing engineer, in charge of all distribution transformers, with headquarters at Pittsfield, has been promoted to acting manager of the Pittsfield works, succeeding **C. C. Chesney**, now vice-president in charge of manufacturing, and **Giuseppe Facciola**, works engineer of the Pittsfield works, has been promoted to associate manager and works engineer of the Pittsfield works.

J. H. Kinney, general sales manager of the Cyclone Fence Company, Waukegan, Ill., has been promoted to general manager, succeeding **J. W. Meaker**, who has resigned to become president of the Bates Valve Bag Company, Chicago. **H. S. Chapman**, treasurer, has been promoted to general sales manager to succeed Mr. Kinney and has been succeeded by **A. W. Kirkham**, assistant treasurer, who in turn has been succeeded by **W. M. Jensen**, cashier. **R. E. Pinniger**, district sales manager at Cleveland, Ohio, has been promoted to eastern sales manager, with headquarters at Newark, N. J., and has been succeeded by **A. W. Burr**, assistant district sales manager at Newark.

Charles W. Bryan, chief engineer of the American Bridge Company, with headquarters at New York, died on June 25 in the New Rochelle, N. Y., hospital. Mr. Bryan was born in 1863 at Washington, Mo., and graduated from Washington University in 1885. After the completion of his college course he was a draftsman for C. Shaler Smith, a well known bridge engineer at St. Louis, Mo., and for the Edge Moor Iron Company, Wilmington, Del., until 1887, with the exception of a few months when he was an engineer in the bridge department of the Missouri Pacific. Mr. Bryan served as an engineer in the designing and estimating office of the Edge Moor bridge works and later as chief engineer until the Edge Moor company was absorbed by the American Bridge Company, when he was transferred to Pittsburgh, Pa., in charge of bridge contracts in that district. In 1901 he was transferred to New York as eastern division contracting manager and in 1906 he was appointed chief engineer of the American Bridge Company of New York, a subsidiary of the American Bridge Company, in addition to his other duties. He was appointed chief engineer of the American Bridge Company in 1906, which position he was holding at the time of his death.

Charles W. Bryan

Paul Kircher, vice-president of the Canadian Concrete Products Company, Ltd., a subsidiary of the Massey Concrete Products Corporation, Chicago, and also resident manager of the Union Switch & Signal Company at Montreal, Que., died in Chicago on June 10 from pneumonia. Mr. Kircher was born on July 27, 1890, at Chicago, and graduated from the University of Illinois in 1911. After leaving school he served as a chainman, rodman and instrumentman for the City of Chicago, and later entered railway service as a draftsman on the Illinois Central. In 1916 he became an engineer in the promotion bureau of the Universal Portland Cement Company, Chicago, leaving that company to become office manager for the Massey Concrete Products Corporation, of which he was later sales manager. In 1919 he was promoted to resident manager of the corporation and also of the Canadian Concrete Products Company, Ltd., with headquarters in New York. In August, 1920, he was promoted to manager of the pole department, with headquarters at Chicago and continued his duties as resident manager of the Canadian company. In 1925, he was elected vice-president of the Canadian Concrete Products Company, with headquarters at Montreal, Que., which office he was holding at the time of his death.

Paul Kircher

Trade Publications

Multiple Tie Plugs.—D. B. Frampton & Company, Pittsburgh, Pa., has recently issued a ten-page booklet in which is described and illustrated the multiple tie plug manufactured by this company, and also a new method of assembling these plugs for shipment and distribution on the right-of-way.

Gasoline Shovels, Ditchers and Cranes—The Orton Crane & Shovel Company, Chicago, has issued a 16-page bulletin, No. 42, describing its Model V gasoline shovel, ditchers and cranes. Illustrations are given of the machines in operation in various classes of work as well as of their important details, together with clearance diagrams for each type of equipment.

Concrete Breakers.—The Sullivan Machinery Company, Chicago, has issued a second edition of Bulletin No. 81-I, a 16-page booklet describing two types of concrete breakers, one a heavy duty tool weighing 75 lb. and the other, for light duty, weighing 48 lb. The book is copiously illustrated showing various kinds of work, both in this country and abroad, on which these tools were used. Performance records are also given for different kinds of work.

Track Circuit Hand Book.—This is the name of a new treatise prepared by M. W. Manz, manager railroad material sales, in collaboration with J. B. Weigel and W. P. Bovard, engineers of the Ohio Brass Company, Mansfield, Ohio, which is of interest to the officer in charge of track maintenance because of the large amount of space devoted to rail bonds. Particular attention is given to the theories and facts concerning the gas welded bonding and the application, maintenance and economy of the low resistance type of bond. Part 2 comprises an exhaustive study of the methods of making computations for a-c. and d-c. track circuits and Part 3 contains a series of tables and charts for use in circuit computations. The book contains 154 pages 7½ in. by 5 in. bound in fabricoid and is well illustrated.

to power units or heads up to [illegible]. The belted pumps are the centrifugal type and all drives by internal combustion engines, usually of the semi-Diesel type. In general, the direct connected units are motor driven, while duplex reciprocating pumps have motor, internal combustion or steam engine drives. Motor trucks are used up to a maximum capacity of 100 gal. per min., number, including the 1 hp. [illegible] controlled by float switches. At a few stations where the discharge head is high, power driven duplex pumps are in service. Gasoline engines are used at about 30 treating plants for the purpose of proportioning the chemical solutions.

The development of the [illegible] plies on the Chicago lines has been under the direction of L. L. Davenport, assistant engineer in charge of water development, under the general supervision of R. B. Ball, chief engineer, and under the general direction of W. K. Etter, [illegible]

KILLING WEEDS

IF ONE were to compare the maintenance methods of today with those of 10 or 20 years ago, one of the changes which he would note would be the increasing attention that is now being paid to refinements in many practices. Nowhere is this being given more consideration than in the eradication of weeds from the track section. Whereas weed elimination was formerly considered a problem on many lines only when they interfered with train operation, it is now considered very generally as an aid to good track maintenance itself and worthy of attention from this standpoint alone. This has come about in part from a growing realization of the destructive effects of vegetation on ballast, on ties and on the maintenance of good line and surface. It is also in no small measure a reflection of the development of improved and more economical methods of controlling weed growth.

With the introduction of the consideration of economy has come the question of how far one is warranted in going to eliminate weeds. This question has been brought prominently to the fore by the acute competition of late between companies promoting the destruction of vegetation by chemicals. Although the principle has long been established that in the long run one gets today only what he pays for, the roads have encouraged the weed killing companies to cut prices severely by playing one against the other in the thought that they were saving money, whereas in most cases the inevitable result has been that they have forced these companies to weaken their treatments. This raises the question of the [illegible] vegetation or, in other words, that of [illegible] which [illegible] desires its work to be done.

Even though the control of vegetation may be considered a detail of maintenance work, it is one for which [illegible] roads with high maintenance standards spend large sums of money. Where chemicals are used a high degree of technical knowledge is required, which knowledge the average railway does not possess. The economical treatment varies with different types of vegetation and with the relative prevalence of seedling and of perennial growths. It varies also in different sections of the country. All vegetation, however, regardless of its type or location, has a "tolerance point" below which it may be sickened by the application of a chemical but will later revive and above which it will be killed.

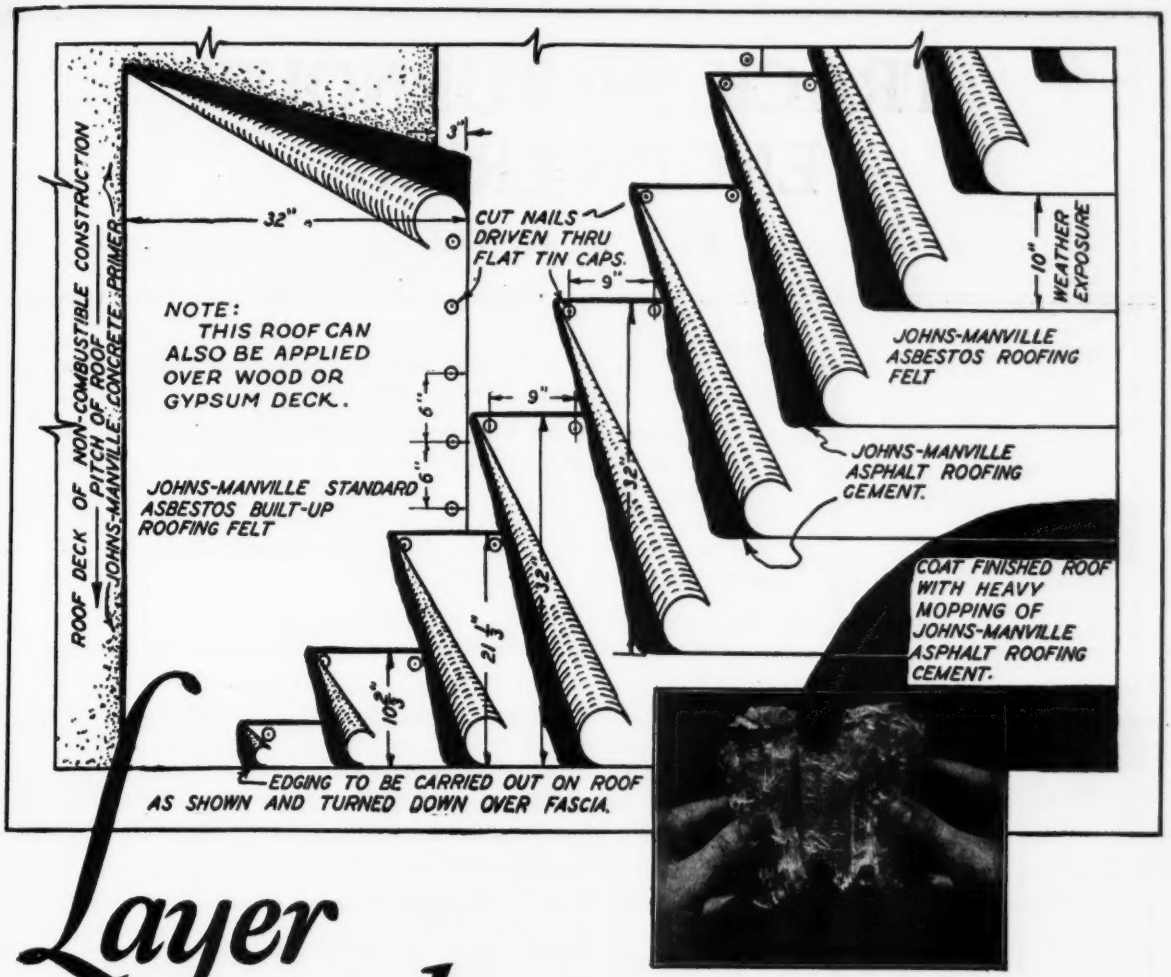
Because of this variation in killing strength required, many roads feel that they are effecting real economies by decreasing the strength of their applications. This point of view has been strengthened by the active competition between the promoters of these materials with the result that much track is today receiving treatment that is only partially effective. This situation is further complicated by the fact that few roads are prepared to determine whether any new growth that appears is seedling growth or the result of incomplete killing of old growths. Another phase of this subject, largely undecided as yet on most roads, is the economy of giving a sufficiently heavy application the first year to kill all perennial growth and then follow with lighter treatments in succeeding years to keep down the seedling growth, as compared with a cheaper but less thorough first treatment with its necessarily heavier treatments in following years.

The demand for weed eradication is an outgrowth of the rising standards of track maintenance. It will become increasingly important in the future. There is a need, therefore, for the more thorough consideration of this subject on the part of many roads in order that they may compare their costs and select their treatments on the basis of accurate comparative costs *for given results* rather than on first costs and casual inspections.

New Books

[illegible] materials, University of Illinois. 5 in. by 7¼ in. 63 pages. Bound in [illegible] Engineering Foundation [illegible]

The break[illegible] a part [illegible] or in some structure af[illegible] that result in stresses well within safe limits has given rise to much misunderstanding. Many people have referred to such [illegible] but it has been definitely proved that no [illegible] tion takes place. More recently the term fatigue of [illegible] has been [illegible] popular misunderstanding of what causes metal members to fail under repeated loads, this little book



Layer upon layer of rock

Crude Asbestos Rock as it comes from the mine before its everlasting fibres are separated and made into Johns-Manville Roofing Felts.

BUILT up of indestructible asbestos fibre felts, every ply of Johns-Manville Asbestos Roofing is literally a layer of everlasting rock.

Such a roof needs no slag or gravel for protection. Its clean, smooth surface drains quickly. There is no loose material to clog the drain pipes.

Such a roof is really permanent. It challenges weather, time and even fire to destroy it. Its first cost includes the upkeep.

JOHNS-MANVILLE CORPORATION, MADISON AVENUE AT 41ST STREET, NEW YORK CITY
BRANCHES IN ALL LARGE CITIES For Canada: CANADIAN JOHNS-MANVILLE CO., LTD., TORONTO

Trade Mark Asbestos and its allied products INSULATION BRAKE LININGS ROOFINGS PACKINGS CEMENTS FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE

Service to Railroads

Buyers' Guide

CLASSIFIED INDEX TO ADVERTISERS

Acetylene Dissolved
Oxweld Railroad Service Company

Air Compressors
Fairbanks, Morse & Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Generator Set
Buda Company

Air Hoists
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Lift Pumping Machinery
Ingersoll-Rand Co.
Sullivan Machinery Co.

Anchors, Rail
See Rail Anchors

Anti-Creepers, Rail
Bethlehem Steel Co.
Lundie Engineering Co.
P. & M. Co.
Track Specialties Co.
Verona Tool Works
Woodings Forge & Tool Co.

Asbestos Products
Johns-Manville Corp.

Asphalt
Barber Asphalt Co.
Lehon Co.

Automatic Take-Up Reels
Hayward Co.

Ballast Screens
Maintenance Equipment Co.

Ballast Spreaders
Jordan Co., O. F.
Western Wheeled Scraper Co.

Bank Builders
Jordan Co., O. F.

Bank Slopers
Jordan Co., O. F.

Ballast Trimmers
Jordan Co., O. F.

Band Saws
American Saw Mill Machy. Co.

Bars
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company

Bearings, Axle
Buda Company
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Company
Northwestern Motor Co.

Bearings, Roller
Hyatt Roller Bearing Co.
Timken Roller Bearing Co.

Benders, Rail
See Rail Benders

Blasting Powders
Du Pont de Nemours & Co., Inc., E. I.

Blasting Supplies
Du Pont de Nemours & Co., Inc., E. I.

Blocks, Paving
Interstate Car & Foundry Co.

Blowers, Turbo
Ingersoll-Rand Co.

Bolts
Bethlehem Steel Co.
Graham Bolt & Nut Co.
Illinois Steel Co.
Louisville Frog & Switch Co., Inc.
Track Specialties Co.

Bonding Outfits, Rail
Ingersoll-Rand Co.

Braces, Track
Edelblute Co., T. H.
Ramapo Ajax Corp.

Bridge Warnings
Hastings Signal & Equip. Co.

Buckets
Hayward Co.
Owen Bucket Co.

Buckets, Clam Shell
Hayward Co.
Owen Bucket Co.

Buckets, Drag Scrape; Orange Peel; Electric Motor
Hayward Co.

Buckets, Tote
Railroad Accessories Corp.

Building Beams, Concrete
Federal Cement Tile Co.
Massey Concrete Prod. Corp.

Building Material
Johns-Manville Corp.

Building Papers
Lehon Co.

Bumpers, Car
Track Specialties Co.

Bumping Posts
Buda Company
Louisville Frog & Switch Co., inc.
Mechanical Mfg. Co.

Calcium Carbide
Oxweld Railroad Service Co.

Car and Locomotive Replacers
Edelblute Co., T. H.

Car Replacers
Edelblute Co., T. H.

Cars, Ballast
See Ballast Cars

Cars, Dump
See Dump Cars

Cars, Hand
Buda Co.
Fairbanks, Morse & Co.
Fairmont Ry. Motors, Inc.
Kalamazoo Ry. Supply Co.
Mudge & Co.
Northwestern Motor Co.

Cars, Industrial
Koppel Industrial Car & Equipment Co.
Magor Car Corp.
Western Wheeled Scraper Co.

Cars, Inspection
Buda Co.
Euclid Electric & Mfg. Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.

Cars, Motor
Buda Co.
Euclid Elegric & Mfg. Co.
Fairbanks, Morse & Co.
Fairmont Ry. Motors, Inc.
Kalamazoo Ry. Supply Co.
Mudge & Co.
Northwestern Motor Co.

Cars, Section
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.

Car, Spreader
Jordan Co., O. F.
Western Wheeled Scraper Co.

Car Stop, Friction
Maintenance Equipment Co.

Cars, Velocipede
Buda Company
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.

Castings
Bethlehem Steel Co.
Louisville Frog & Switch Co., Inc.
Wharton, Jr. & Co., Inc., Wm.

Cattle Guards
Fairbanks, Morse & Co.
Kalamazoo Railway Supply Co.

Cattle Passes
Massey Concrete Products Corp.

Cement, High Temperature
Johns-Manville Corp.

Cement Repair
Barber Asphalt Co.
Carey Co., Philip

Clamshell Buckets
See Buckets, Clamshell

Clips, Adjustable
Ramapo Ajax Corp.

Coal Handling Machinery
Hayward Co.

Coaling Stations
Fairbanks, Morse & Co.

Compressors
Ingersoll-Rand Co.
Sullivan Machinery Co.

Compromise Joints
See Joints, Compromise

Concrete Units, Miscellaneous
Federal Cement Tile Co.
Massey Concrete Prod. Corp.

Condensers
Ingersoll-Rand Co.

Corrugated Iron
Armco Culvert & Flume Mfrs. Ass'n.

Counterweight Drums
Hayward Co.

Cranes, Barge, Electric Erecting, Gantry, Locomotive, Pillar, Transfer, Tunnel, Wharf and Wrecking
Brown Hoisting Machinery Co.
Interstate Car & Foundry Co.

Creosoted Timber
See Timber, Creosoted

Cribbing, Concrete
Federal Cement Tile Co.
Massey Concrete Products Corp.

Crossing Gates
Buda Co.
Kalamazoo Railway Supply Co.

Crossings, Highway
Barber Asphalt Co.
Carey Co., Philip
Headley Good Roads Co.
Ohio Valley Rock Asphalt Co.

Crossings, Rail
Bethlehem Steel Co.
Buda Co.
Interstate Car & Foundry Co.
Louisville Frog & Switch Co., Inc.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Crushers, Stone
Western Wheeled Scraper Co.

Culvert Pipe
American Cast Iron Pipe Co.
American Casting Co.
Armco Culvert & Flume Mfrs. Ass'n.
Central Alloy Steel Corp.
Massey Concrete Products Corp.

Curbing
Massey Concrete Products Corp.

Derails
Track Specialties Co.
Wharton Jr. & Co., Wm.

Derailing Switches
Ramapo Ajax Corp.

Derrick Cars
Maintenance Equipment Co.

Diesel Engines
Fairbanks, Morse & Co.
Ingersoll-Rand Co.

Diesel Electric Power Plants
Fairbanks, Morse & Co.
Ingersoll-Rand Co.

Discing Machines
Fairmont Railway Motors, Inc.

Disinfectants
Chipman Chemical Engineering Co.

Ditchers
Jordan Co., O. F.

Drains, Perforated
Central Alloy Steel Corp.

Drills, Earth
Buda Co.

Drills, Pneumatic
Ingersoll-Rand Co.

Drills, Rock
Ingersoll-Rand Co.
Sullivan Machinery Co.
Verona Tool Works

Drill Steel, Rock
Ingersoll-Rand Co.
Sullivan Machinery Co.

Drills, Track
Buda Co.
Ingersoll-Rand Co.
Kalamazoo Railway Supply Co.
Railroad Accessories Corp.

Dump Cars
Koppel Industrial Car & Equipment Co.
Jordan Co., O. F.
Western Wheeled Scraper Co.

Dynamite
Du Pont de Nemours & Co., Inc., E. I.

Electric Cranes (Locomotive, Pillar, Transfer & Wrecking)
See Cranes

Electric Light & Power Plants
Fairbanks, Morse & Co.

Electric Power Units
Electric Tamper & Equipment Co.
Euclid Electric & Mfg. Co.
Northwestern Motor Co.
Syntron Co.

Engines, Gasoline
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Ingersoll-Rand Co.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.

Engines, Motor Car
Buda Co.
Euclid Electric & Mfg. Co.
Fairbanks, Morse & Co.
Fairmont Railway Motor Co.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.

Engines, Oil
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Ingersoll-Rand Co.

Explosives
Du Pont de Nemours & Co., Inc., E. I.

Fences
American Steel & Wire Co.
Cyclone Fence Co.
Page Fence Association

Fence, Fabric
American Steel & Wire Co.
Cyclone Fence Co.
Page Fence Association

Fence Posts
Maintenance Equipment Co.
Massey Concrete Products Corp
Page Fence Association

Figures, Sign
Niagara Metal Stamping Corp.

Filters
American Water Softener Co.

Fire Fighting and Protection Equipment
Johns-Manville Corp.

Float Valves
Fairbanks, Morse & Co.

Floor Coverings
Barber Asphalt Co.
Lehon Co.

Flooring Compositions
Johns-Manville Corp.

Foot Guards
Track Specialties Co.

Forgings
Bethlehem Steel Co.
Interstate Car & Foundry Co.

Frogs
Bethlehem Steel Co.
Buda Co.
Interstate Car & Foundry Co.
Louisville Frog & Switch Co., Inc.
Ramapo Ajax Corp.
Track Specialties Co.
Wharton Jr. & Co., Inc., Wm.

Gages, Measuring
Lufkin Rule Co.

Gages, Pressure Gas
Oxweld Railroad Service Co.

Gas, Acetylene
Oxweld Railroad Service Co.

Gauge Rods
Edelblute Co., T. H.
Track Specialties Co.

Graders, Elevating
Western Wheeled Scraper Co.

Grading Machinery
Western Wheeled Scraper Co.

Graphite
Dixon Crucible Co., Jos.

Grinders, Portable
Buda Co.
Ingersoll-Rand Co.

Guard Rails
Bethlehem Steel Co.
Buda Co.
Carnegie Steel Co.
Louisville Frog & Switch Co., Inc.
Ramapo Ajax Corp
Wharton Jr. & Co., Wm.

Guard Rail Braces
Track Specialties Co.

Guard Rail Clamps
Bethlehem Steel Co.
Buda Co.
Louisville Frog & Switch Co., Inc.
Ramapo Ajax Corp.
Track Specialties Co.
Wharton Jr. & Co., Wm.

Hammers, Chipping, Scaling and Calking
Ingersoll-Rand Co.

Hammer Drills
Ingersoll-Rand Co.
Sullivan Machinery Co.

Hammers, Forge
Sullivan Machinery Co.

Hammers, Riveting
Ingersoll-Rand Co.
Sullivan Machinery Co.

Hand Car Bearings
Hyatt Roller Bearing Co.
Timken Roller Bearing Co.

Head Drains, Perforated
Central Alloy Steel Corp.

Heaters, Feed Water
American Water Softener Co.

Highway Crossings
See Crossings, Highway

Hoisting Machinery
Brown Hoisting Machinery Co.
Fairbanks, Morse & Co.
Ingersoll-Rand Co.

Hoists, Air Motor
Ingersoll-Rand Co.

Hose
Ingersoll-Rand Co.

House Lining
Barber Asphalt Co.
Lehon Co.

Ice Cutters
Jordan Co., O. F.

Inspection Cars
See Cars, Inspection

Inspection, Engineering
Hunt Co., Robert W.

Insulated Rail Joints
Bethlehem Steel Co.
Rail Joint Co.
Track Specialties Co.

Insulating Material
Barber Asphalt Co.
Johns-Manville Corp.
Lehon Co.

Jacks, Bridge
Buda Co.
Kalamazoo Railway Supply Co.

Jacks, Smoke
Johns-Manville Corp.

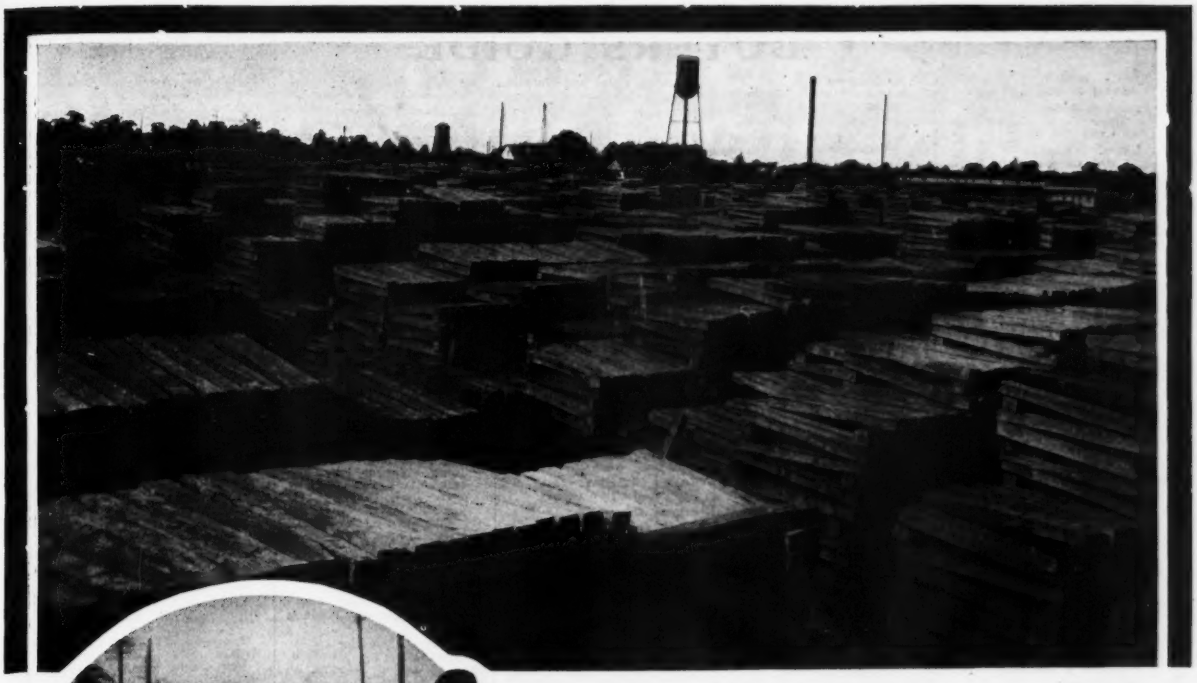
Jacks, Track
Buda Company
Hackmann Railway Supply Co.
Kalamazoo Railway Supply Co.
Verona Tool Works

Joints, Compromise
Bethlehem Steel Co.
Metal & Thermit Corp.
Rail Joint Co.
Track Specialties Co.

Joint Fastenings
Illinois Steel Co.

Joints, Rail
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company
Metal & Thermit Corp.
Rail Joint Co.
Track Specialties Co.
Wharton Jr. & Co., Wm.

Joints, Step
Illinois Steel Company
Rail Joint Co.
Track Specialties Co.



2C7
The International Dating Nail

How Are The Ties You Put Into Track Handled Before They Reach You?

ARE they removed quickly from the woods or are they allowed to lie around and decay?

Are they seasoned on specially built, tile drained, vegetation-free seasoning yards or are they seasoned along the right of way overrun with weeds where they will decay?

Are they concentrated and stacked in the proper manner so they can be watched constantly or are they scattered all along the line so as to become stack burnt and decayed?

Are they full size ties or are they overgraded so they cannot stand up under the traffic for which they were specified?

Are they treated with A. R. E. A. Grade I creosote oil or with any ordinary oil?

All these factors have a direct bearing on tie life and the cost of manufacture. It will pay to investigate how the ties you put in track are handled before they reach you.

International Creosoting & Construction Co.
General Office—Galveston, Texas

— See —
Railway Engineering and Maintenance 1926 Cyclopedia Edition
for detailed information

International
STANDARD SPECIFICATION TIES

BUYERS' GUIDE

Joints, Welded
Metal & Thermit Corp

Junction Boxes
Massey Concrete Products Corp.

Liners, Track
Chicago Steel Foundry Co.
Hackmann Railway Supply Co.
Rail Joint Co.
Track Specialties Co.

Lock Washers
National Lock Washer Co.
Reliance Manufacturing Co.
Track Specialties Co.

Locomotives, Oil Engine Electric Driven
Ingersoll-Rand Co.

Lubricants
Dixon Crucible Co., Jos.

Lumber, Asbestos
Joans-Manville Corp.

Manganese Track Work
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Manholes
Massey Concrete Products Corp.

Markers
Massey Concrete Products Corp.
Niagara Metal Stamping Corp.

Mile Posts
Massey Concrete Products Corp.

Mono Cars
Track Specialties Co.

Motor Bearings
Hyatt Roller Bearing Co.
Timken Roller Bearing Co.

Motor Car Accessories
Mudge & Company

Motor Cars
See Cars, Motor

Motors and Generators
Fairbanks, Morse & Co.

Mowing Machines
Fairmont Railway Motors, Inc.
Mudge & Co.

Nails, Tie Dating & Marking
Track Specialties Co.

Non-Derailer
Ramapo Ajax Corp.

Numbers, Aluminum
Niagara Metal Stamping Corp.

Nut Locks
National Lock Washer Co.
Reliance Manufacturing Co.
Verona Tool Works
Woodings Forge & Tool Co.

Nuts
Bethlehem Steel Co.
Graham Bolt & Nut Co.
Illinois Steel Co.
Interstate Car & Foundry Co.

Oil Engines
See Engines, Oil

Out Houses
Massey Concrete Products Corp.

Oxygen
Oxweld Railroad Service Co.

Oxy-Acetylene Welding Equipment
Oxweld Railroad Service Co.

Packing, Asbestos
Johns-Manville Corp.

Paint
Chipman Chemical Engineering Co.
Dixon Crucible Co., Jos.

Paint, Metal Protecting
Barber Asphalt Co.
Dixon Crucible Co., Jos.

Pavement Breakers
Ingersoll-Rand Co.
Sullivan Machinery Co.

Penstocks
Fairbanks, Morse & Co.

Pile Drivers
Brown Hoisting Machinery Co.
Ingersoll-Rand Co.

Piling
Carnegie Steel Co.
International Creosoting & Construction Co.
Massey Concrete Products Corp.

Pipe, Cast Iron
American Cast Iron Pipe Co.
American Casting Co.
Cast Iron Pipe Publicity Bureau
U. S. Cast Iron Pipe & Foundry Co.

Pipe Carriers
Massey Concrete Products Corp.

Pipe, Concrete
Massey Concrete Products Corp.

Pipe, Corrugated
Armco Culvert & Flume Mfrs. Ass'n

Pipe, Sewer
Massey Concrete Products Corp.
American Casting Co.

Pipe Joint Compound
Dixon Crucible Co., Jos.

Plates, Miscellaneous
Track Specialties Co.
Ramapo Ajax Corp.

Platforms, Station
Headley Good Roads Co.

Plows, Railroad
Western Wheeled Scraper Co.

Poles
International Creosoting & Construction Co.
Massey Concrete Products Corp.

Post Hole Digger
Buda Company

Posts, Fence
See Fence Posts

Posts, Bumping
See Bumping Posts

Powders
Du Pont de Nemours & Co., Inc., E. I.

Power Plants, Portable
Electric Tamper & Equipment Co.
Northwestern Motor Co.
Syntron Co.

Preformed Track Pavement
Carey Co., Philip

Preservation, Timber
International Creosoting & Construction Co.

Products, Gas
Oxweld Railroad Service Co.

Pumps, Air Pressure & Vacuum, Centrifugal, Deep Well, Piston, Plunger, Rotary, Slump
American Well Works
Fairbanks, Morse & Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.
United Iron Works, Inc.

Push Cars
Buda Company
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.

Push Car Bearings
Hyatt Roller Bearing Co.
Timken Roller Bearing Co.

Rail Anchors
Bethlehem Steel Co.
Lundie Engineering Corp.
P. & M. Co.
Track Specialties Co.
Verona Tool Works
Woodings Forge & Tool Co.

Rail Anti-Creepers
See Anti-Creepers, Rail

Rail Benders
Buda Co.
Louisville Frog & Switch Co., Inc.
Track Specialties Co.
Verona Tool Works

Rail Bonds
Verona Tool Works

Rail Braces
Bethlehem Steel Co.
Buda Co.
Louisville Frog & Switch Co., Inc.
Track Specialties Co.
Ramapo Ajax Corp.
Wharton Jr., & Co., Wm.

Rail Chair
Track Specialties Co.

Rail Clip
Track Specialties Co.

Rail Expanders
Ramapo Ajax Corp.

Rail Joints
See Joints, Rail

Rail Layers
Maintenance Equipment Co.
Parsons Co.

Rail Saws, Portable
Kalamazoo Railway Supply Co.
Track Specialties Co.

Rail Springs
Verona Tool Works

Rails, Girder
Bethlehem Steel Co.

Rails, Tee
Bethlehem Steel Co.
Carnegie Steel Co.

Regulators, Oxy-Acetylene
Oxweld Railroad Service Co.

Removers, Paint and Varnish
Mudge & Co.

Replacers, Car
Buda Co.
Edelblute Co., T. H
Track Specialties Co.

Replacers, Car & Locomotive
Edelblute Co., T. H.

Replacing Frogs
Edelblute Co., T. H.

Rerailers
Edelblute Co., T. H.

Retaining Walls, Precast
Federal Cement Tile Co.
Massey Concrete Product Corp.

Rivets
Bethlehem Steel Co.
Louisville Frog & Switch Co., Inc.

Rock Hammers
Ingersoll-Rand Company

Rods, Welding
Oxweld Railroad Service Co.

Roof Slabs
Federal Cement Tile Co.
Massey Concrete Products Corp.

Roofing, Asbestos
Johns-Manville Corp.

Roofing Composition
Barber Asphalt Co.
Lehon Co.

Roofing, Corrugated
Johns-Manville Corp.

Rules
Lufkin Rule Co.

Saw Mills
American Saw Mill Machy. Co.

Saw Rigs
Fairbanks, Morse & Co.
American Saw Mill Machy. Co.

Saws, High Speed Friction
American Saw Mill Machy. Co.

Scales, Tape
Lufkin Rule Co.

Scales, Track
Fairbanks, Morse & Co.

Scrapers, Wheel, Drag & Buck
Western Wheeled Scraper Co.

Screw Spikes
Illinois Steel Company
Track Specialties Co.

Screw Spike Drivers
Ingersoll-Rand Co.

Screw Spike Wrench
Track Specialties Co.

Section Cars
See Cars, Section

Sharpeners, Rock Drill Steel
Ingersoll-Rand Co.

Sheathing Paper
Barber Asphalt Co.
Lehon Co.

Sheet Iron
Armco Culvert & Flume Mfrs. Ass'n.

Sheets, Corrugated
Johns-Manville Corp.

Shims
Track Specialties Co.

Shingles, Composition
Barber Asphalt Co.
Lehon Co.

Shovels
Interstate Car & Foundry Co.
Verona Tool Works
Woodings Forge & Tool Co.

Siding, Corrugated and Plain
Johns-Manville Corp.

Signal Foundations, Concrete
Massey Concrete Products Corp.

Signals, Bridge Warnings
Hastings Signal & Equip. Co.

Skid Excavators & Dredges
Hayward Co.

Slabs, Concrete
Massey Concrete Products Corp.

Smoke Stacks
Massey Concrete Products Corp.

Snow Fence
Track Specialties Co.

Snow Plows
Jordan Co., O. F.

Spike Pullers
Louisville Frog & Switch Co., Inc.

Spikes
Bethlehem Steel Co.
Illinois Steel Company
Track Specialties Co.

Spreader Cars
See Cars, Spreader

Spreaders, Ballast
See Ballast Spreaders

Standpipes (Penstock)
Fairbanks, Morse & Co.

Stands, Switch & Target
Bethlehem Steel Co.
Ramapo Ajax Corp.

Steel, Alloy
Central Alloy Steel Corp.
Illinois Steel Company

Steel Cross Ties
Carnegie Steel Co.

Steel Plates and Shapes
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company

Step Joints
See Joints, Step.

Storage Tanks
Pittsburgh Des Moines Co.

Structural Steel
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company

Switch Guard
Ramapo Ajax Corp.

Switches
Bethlehem Steel Co.
Buda Company
Interstate Car & Foundry Co.
Louisville Frog & Switch Co., Inc.
Ramapo Ajax Corp.
Track Specialties Co.
Wharton Jr. & Co., Wm.

Switch Brace
Track Specialties Co.

Switchmen's Houses
Massey Concrete Products Corp.

Switchpoint Protector
Maintenance Equipment Co.

Switchstands & Fixtures
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Track Specialties Co.
Wharton Jr. & Co., Wm.

Tampers, Tie
See Tie Tampers

Tank Fixtures
Fairbanks, Morse & Co.

Tanks, Steel
Pittsburgh Des Moines Co.

Tape, Insulating
Johns-Manville Corp.

Tapes, Measuring
Lufkin Rule Co.

Tee Rails
See Rails, Tee.

Telephone Service, Long Distance
American Telephone & Telegraph Co.

Telegraph Poles
See Poles

Telegraph Service, Long Distance
American Telephone & Telegraph Co.

Telltales
Hastings Signal & Equipment Co.

Testing of Materials
Hunt Co., Robert W.

Thermit Welding
Metal & Thermit Corp.

Ties
International Creosoting & Construction Co.

Tie Plates
Bethlehem Steel Co.
Illinois Steel Co.
Lundie Engineering Corp.
Sellers Manufacturing Co.
Track Specialties Co.

Tie Rods
Bethlehem Steel Co.
Track Specialties Co.

Tie Spacers
Maintenance Equipment Co.

Ties, Steel
Track Specialties Co.

Tie Tampers
Electric Tamper & Equipment Co.
Ingersoll-Rand Co.
Syntron Co.

Ties, Tongs
Track Specialties Co.

Timber, Bridge
Interstate Car & Foundry Co.

Timber, Creosoted
International Creosoting & Construction Co.

Timber, Slab
Interstate Car & Foundry Co.

Tile, Roofing
Federal Cement Tile Co.

Track, Special Work
Ramapo Ajax Corp.
Wharton, Jr., & Co., Wm.

Tools, Oxy-Acetylene Cutting & Welding
Oxweld Railroad Service Co.

Tools, Pneumatic
Ingersoll-Rand Co.

Tools, Track
Buda Co.
Hackman Railway Supply Co.
Maintenance Equip. Co.
Track Specialties Co.
Verona Tool Works
Woodings Forge & Tool Co.

Tongue Switches
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. Co., Wm.

Torches, Oxy-Acetylene Cutting & Welding
Oxweld Railroad Service Co.

Track Barrow
Track Specialties Co.

Track Braces
See Braces, Track

Track Drills
See Drills, Track

Track Gages
Buda Co.
Kalamazoo Railway Supply Co.
Louisville Frog & Switch Co., Inc.
Track Specialties Co.

Track Jacks
See Jacks, Track

Track Levels
Kalamazoo Railway Supply Co.
Track Specialties Co.

Track Liners
See Liners, Track

Track, Portable
Western Wheeled Scraper Co.

Track Tools
See Tools, Track

Treating Plants, Water
American Water Softener Co.

Trestle Slabs
Massey Concrete Products Corp.

Tunnel Warnings
Hastings Signal & Equipment Co.

Ventilators
Johns-Manville Corp.

Warning Devices, Bridge & Tunnel
Hastings Signal & Equipment Co.

Water Columns
Fairbanks, Morse Co.

Water Cranes
Fairbanks, Morse Co.

Water Softening Plants
American Water Softening Co.

Water Tanks
Pittsburgh Des Moines Co.

Water Treating Plants
American Water Softening Co.

Waterproofing Fabrics
Barber Asphalt Co.
Johns-Manville Corp.
Lehon Co.

Weed Burner
Woolery Machine Co.

Weed Killer
Chipman Chemical Engineering Co., Inc.

Welding & Cutting Equipment
Oxweld Railroad Service Co.

Welding, Oxy-Acetylene
Oxweld Railroad Service Co.

Welding, Thermit
Metal & Thermit Corp.

Wheels, Hand & Motor Car
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.

Wheels, Wrought Steel
Carnegie Steel Co.

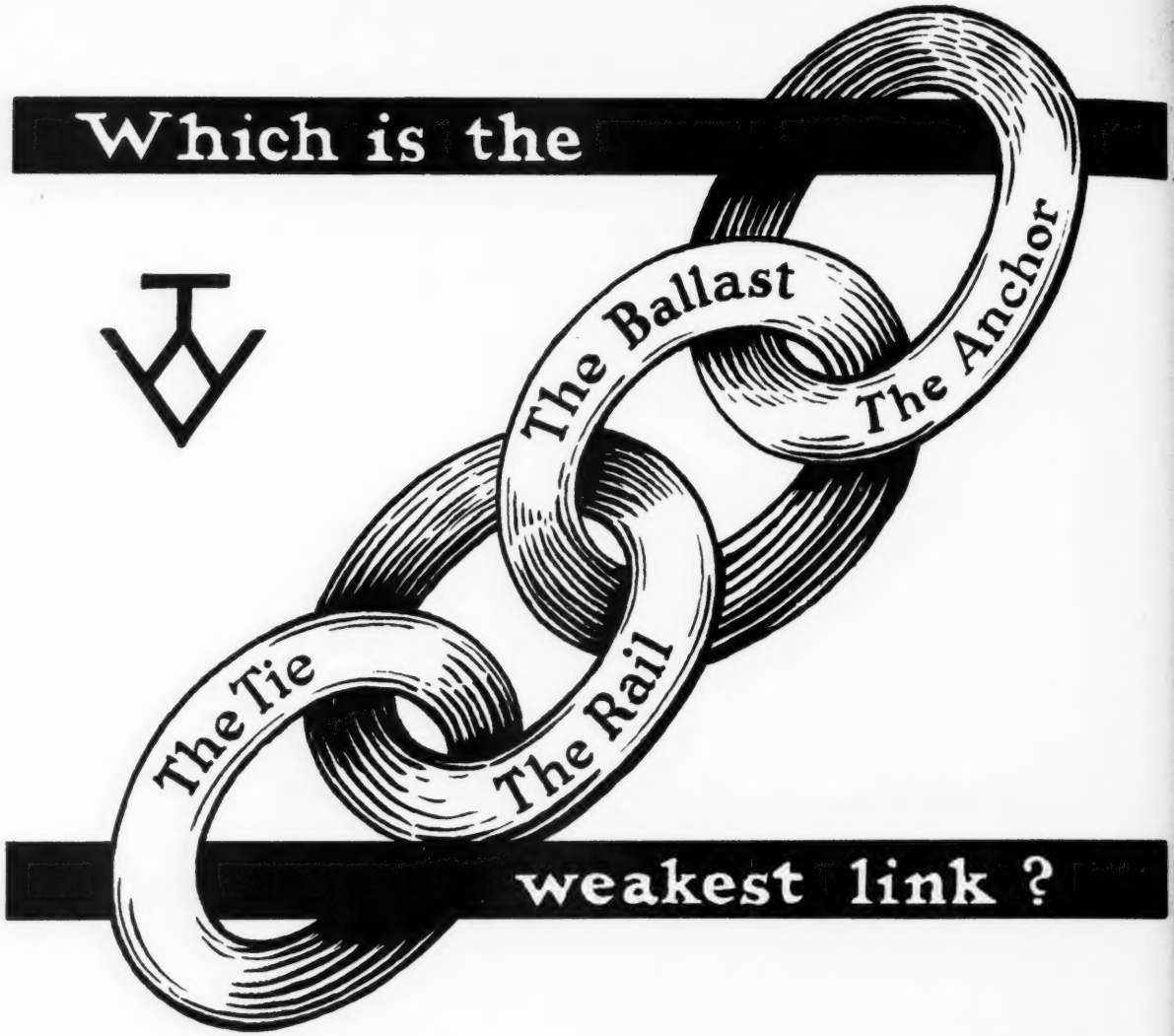
Windshields
Mudge & Co.
Fairbanks, Morse & Co.

Wire Fencing
American Steel & Wire Co.
Cyclone Fence Co.
Page Fence Association

Wood Preservation
See Preservation, Timber

Wood Working Machinery
American Saw Mill Machy. Co.

ALPHABETICAL INDEX TO ADVERTISERS



THE business of stopping rail from creeping may be likened to a chain—whose strength is in its weakest link.

It is fairly safe to assume that in general, the weakest link in any anti-creeping chain is either the rail-anchor or the ballast.

If it is the anchor, the rail will creep because the anchor loses its position on the rail. If it is the ballast, the rail will creep because the anchor carries the bearing tie along with it.

If the ballast is the weakest link, more rail anchors will remedy the trouble.

If the anchor is the weakest link, the only proper remedy is to find an anchor that is stronger than the ballast—an anchor that will carry the bearing tie right through the ballast under severe conditions of service, but will never relax its hold upon the rail. Such an anchor applied to enough ties absolutely solves the problem of rail creeping.

The Ericson Rail Anchor is an anchor of this type. In any track to which it is applied, it makes the ballast the weakest link.

Determine the cause of creepage on your track. Use anchors that are stronger than the ballast.

VERONA TOOL WORKS · PITTSBURGH